EXAMINING PARENTS' EXPERIENCES IN A STANDARDS-BASED
MATHEMATICS CLASSROOM

Deborah Blume

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Supervisor of Dissertation:

Janine D. Remillard, Associate Professor of Education

Dean, Graduate School of Education:

Andrew C. Porter, Dean

Dissertation Committee:

Janine D. Remillard, Associate Professor of Education
Peter J. Kuriloff, Professor of Education
Leslie K. Nabors Olah, Research Assistant Professor
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DEDICATION AND ACKNOWLEDGEMENTS

My deepest love and gratitude to my parents for their support throughout this endeavor; I hope you know how much I appreciate all that you have done for me.

To my little boys who took naps so that I could write and my husband for his support; I love you.

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To the amazing parents who took time out of their busy schedules to help me with this project; without you, I would not be where I am.
ABSTRACT

EXAMINING PARENTS' EXPERIENCES IN A STANDARDS-BASED MATHEMATICS CLASSROOM

Deborah Blume
Janine D. Remillard

Recent efforts to reform mathematics education in the United States have caused confusion for those at home. Parents and caregivers who learned math through traditional approaches are unsure how to help their children with math taught in unfamiliar ways (Peressini, 1998; Remillard & Jackson, 2006). Many educational researchers believe that, in order for the current reform to survive, parents need to be given opportunities to participate actively in their children’s mathematics learning (Civil & Bernier, 2006; Lehrer & Shumow, 1997; Remillard & Jackson, 2006). These researchers claim that parents have been ignored and excluded from the process of reform and its enactment.

I designed and conducted a teacher research-based intervention study to increase parents’ engagement with and understanding of standards-based mathematics education. Parents visited my math classroom twice monthly and participated in all aspects of lessons. Research questions focused upon change. How do parents’ beliefs and actions change over time as they participate in the study? The six core participants changed in three main ways. They learned about the curriculum used in my classroom, they changed
the way they work with their children outside of school and they changed their beliefs
about mathematics teaching and learning.
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Chapter 1: Introduction

Problem Statement

A Nation at Risk, published in 1983, painted a grim picture of the American education system. At this time, common perception was that the United States was falling behind as a leader in the world of technology and a failing education system was to blame. In response, The National Council of Teachers of Mathematics (NCTM) published various documents that have come to be known as the Standards. First, in 1989, NCTM published *Curriculum and Evaluation Standards for School Mathematics*. These standards were later revised and published as The *Principles and Standards for School Mathematics* in 2000. Both sets of standards identify needed changes to mathematics education in two categories, content and process. The content standards identify the content to be instructed at each grade level. For example, measurement is one of the content categories for grades three through five. More specifically, students in these grades should be able to “apply appropriate techniques, tools, and formulas to determine measurements” (NCTM, 2000, p. 170). Process standards emphasize the manner in which students will learn and apply content knowledge. For instance, communication is a process category for all grades. One of the goals of this standard is for students to be able to “use the language of mathematics to express mathematical ideas precisely” (NCTM, 2000, p. 193).

The current reform to mathematics education in the United States is based upon the principles set forth in the Standards documents. The publication of the NCTM standards in 1989 launched a number of reform efforts to fundamentally change the way
math is taught in this country. Within two years, the National Science Foundation (NSF) "had issued calls for proposals that would create comprehensive instructional materials for elementary, middle, and high schools consistent with the calls for change in the Curriculum and Evaluation Standards" (Senk & Thompson, 2003, p. 14). Over the next few years, NSF funded numerous projects to develop instructional materials at all grade levels. Thus, standards-based curricula and instruction were born.

Schools' efforts to enact this reform have caused confusion for those at home. Parents and caregivers who learned math through procedure-based approaches are unsure how to help their children with math taught in unfamiliar ways (Peressini, 1998; Remillard & Jackson, 2006). Many researchers believe that, in order for the current reform to survive, parents need to be given opportunities to participate actively in their children's learning (Civil & Bernier, 2006; Lehrer & Shumow, 1997; Remillard & Jackson, 2006). These researchers claim that parents have been ignored and excluded from the process of reform and its enactment. In addition, many parents do not understand standards-based curricula and its goals. Various interventions designed to involve parents in their children's learning of standards-based mathematics have been studied (and will be discussed in Chapter 2). Researchers conducting such work have found that their chosen interventions assist, educate and empower both parents and students.

In September 2000, I began teaching fourth grade at Monroe\(^1\) Elementary in the Hamilton School District. Throughout my employment, the district utilized Everyday Mathematics (University of Chicago School Mathematics Project, 2001), a standards-

\(^1\) Names of people and places are pseudonyms.
based mathematics curriculum, in the elementary grades. According to one of the district’s curriculum coordinators, the program had been in place at Hamilton since 1995.

Through graduate school coursework, I had become familiar with standards-based approaches to mathematics teaching and learning. However, I had never used such curricula in a classroom. In addition, my own mathematics learning had been based more upon mathematical procedures than conceptual understanding. Thus, implementing *Everyday Mathematics* proved to be a challenge for the first few years. I often elicited help from my teaching mentor and spent a good deal of time outside of school becoming familiar with the program and preparing for lessons.

As the years progressed, my comfort level with *Everyday Mathematics* grew. I came to appreciate this approach to mathematics teaching, mostly due to the positive response from students. Specifically, I noticed that students enjoyed the freedom and power that *Everyday Mathematics* afforded them. For instance, students were often allowed to choose a partner, various manipulatives and tools were at their disposal, and games were included in many lessons.

At the same time, however, I was ignoring a problem that continued with each passing year. Parents and caregivers often had difficulty helping their children with mathematics at home. For instance, many parents taught their children the algorithms they had learned in school. Neither parents nor children easily saw the connections between the conventional algorithms and those used in *Everyday Mathematics*. In addition, many parents felt unprepared to help with math at home, forcing their children
to work through homework alone. For students who struggled with math, this made the homework process difficult.

Thus, I designed this study to empower parents by involving them in their children's learning process. My hypothesis was that, through observing and participating in a standards-based mathematics classroom, parents would gain a greater understanding of the ideas behind the reform. I also speculated that becoming involved would enhance parents' roles in their children's learning. This dissertation details my teacher research-based intervention study designed to increase parents' engagement with and understanding of standards-based mathematics education.

The following are the research questions I set out to explore when planning this study:

1. What are parents' levels of understanding when it comes to *Everyday Mathematics*?
   - Does participating in math class enhance their understanding of mathematics and/or the curriculum?
   - Does participating in math class change their opinion of the curriculum?

2. What are parents' beliefs about mathematics teaching and learning?
   - Does participating in this study change their beliefs?

3. What do parents focus upon during their visits to the classroom?
   - What determines this focus?

4. In what ways do parents work with their children at home?
   - Does visiting math class change this in any way?
My Viewpoint

As a learner of mathematics, I was always enthusiastic and successful. Math was a favorite subject for me in school and in life. In fact, I arrived at college with an advanced placement credit in calculus and even considered a major in mathematics. When I began to take education courses, I found my love for math once more and was fascinated by the standards-based curricular materials introduced to me.

I began teaching fourth grade at Monroe in the fall of 2000, one year after receiving my Master’s degree. I used the *Everyday Mathematics* curriculum from the beginning of my employment. I spent a good deal of time preparing for math lessons outside of the classroom for the first few years. After that, I began to feel more and more comfortable with the program. As described above, I learned to love the constructivist nature of the lessons and the positive impact on students.

The success I have experienced utilizing standards-based math curricula influences me in a noteworthy manner. Due to my positive feelings toward the curriculum, I consider myself to be pro-reform, hoping to see the current reform to mathematics education succeed. Believing in the effectiveness of this reform is an important underlying assumption; it has a significant effect on the tone of this dissertation.

Definition of Terms

Throughout the dissertation, I use several terms that might be unfamiliar to the reader or have multiple meanings. These terms and the definitions I use are below.
Standards-Based

I use the term standards-based reform to refer to the current movement to enhance mathematics education in the United States. This reform was a response to the vision for mathematics teaching and learning set forth by the NCTM Standards.

In addition, I use the term standards-based curricula often. These programs were written based upon the recommendations of the NCTM Standards. According to Senk and Thompson (2003), the authors of the Standards documents “argue that at all grade levels there should be less emphasis on memorization of facts and rules, and greater emphasis on active engagement and problems set in realistic contexts that have meaning for students” (p. 12). For example, in the Everyday Mathematics fourth grade curriculum, there is time for multiplication fact practice, but it is not a main focus. Solving problems while working with peers is a more obvious goal of the curriculum. Most of these problems contain some element of real world context such as measuring scale drawings of bugs or using containers to demonstrate volume.

In addition to these elements, standards-based curricular programs emphasize the use of technology (including calculators) and manipulatives, heterogeneous grouping, multiple mathematical strategies, and small group work. Standards-based mathematics education is constructivist in nature, placing importance upon students constructing their own knowledge (Senk & Thompson, 2003). Thus, the focus is upon the process of learning. This differs from procedure-focused mathematics education in which what a student learned was more important than how she learned.
In some ways, my use of the term standards-based is problematic. Although all of the teachers at Monroe used *Everyday Mathematics*, each of us had a different teaching style that would have affected our presentation of the curriculum, making my “standards-based” mathematics classroom look different than the classroom just next door. And, although all standards-based curricula are built upon similar principles of teaching and learning, they are different from each other as well. Another issue to consider is that I use the terms procedure-focused and traditional to represent approaches to teaching that contrast with standards-based ones. Something for the reader to consider is that there are degrees of “constructivist” or “procedure-focused” approaches.

*Everyday Mathematics*

*Everyday Mathematics* is a standards-based mathematics curriculum. It is an elementary school program, written for pre-kindergarten through sixth grade students. According to Remillard and Jackson (2006), “The curriculum was designed to develop fluency with numbers, conceptual understanding, and an understanding of the applications of mathematics in daily life” (p. 238). Thus, the program differs drastically from textbook-driven math curricula. Teachers present multiple ways to solve problems and encourage students to share strategies. Lessons include time for students to engage in whole group, small group and individual work. Tools, such as calculators, number lines and manipulatives are essential for helping students solve problems.

Interestingly, according to Carroll and Isaacs (2003), “Probably the best way to understand *EM*\(^2\) is to observe some lessons in a school where it is well implemented” (p.

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\(^2\) EM is an abbreviation for *Everyday Mathematics.*
Thus, it is difficult to understand without being present in the classroom. This is one of the main reasons behind the design of this study.

Parents

This intervention was designed to impact caregivers of fourth grade students. In all of the documents and emails that were sent to the community, I made it clear that any caregiver of a fourth grader was welcome to participate. Since so many Monroe families have two working parents, there was a distinct possibility that an aunt, uncle or grandparent might have visited the classroom. As it turned out, my only participants were mothers or fathers. However, I believe it is important for educators to acknowledge that parents are not the only ones helping children with schoolwork. Many students attend aftercare programs and others come home to older siblings or other family members. Educating parents about the reform is not enough; this needs to be a community effort.

Visitation

Visitation is a term I use often throughout the dissertation. This is a word with which I grappled quite a bit. The word visitation does not fully capture the intervention I tried to create for participants. My intention was for parents to attend class and have whatever experience they were seeking. For instance, if a parent was there to learn, perhaps she would remain seated for most of the teacher-directed portion of the lesson. Others may have felt more comfortable walking around the room and observing students while I taught. I hoped that parents would not only visit, but would also experience, learn, and grow. As will be documented, they did.
Layout of Dissertation

This dissertation is divided into six chapters. In the next chapter, I present my review of the literature involving parents and standards-based mathematics. Also included are the conceptual and theoretical frameworks upon which my study is based. In Chapter 3, I give a detailed description of the research methods utilized for this study, along with details about my site and population. Chapter 4 is the first of two chapters in which I present my data and findings. This chapter is devoted to the quantitative data collected through parent questionnaires. In the second of the two data chapters, I introduce the reader to the core group of participants and present my key findings based upon the qualitative data collected during the study. I present my exploratory analysis of the data along with my theory of change in the final chapter. Also included in Chapter 6 are implications for teaching and future research.
Chapter 2: Review of the Literature

The literature in the area of parents and standards-based mathematics education is somewhat limited. The following discussion presents the scholarly work that has been published in this area. As will be depicted, parents have not been encouraged to engage with the standards-based mathematics education in place in their children’s schools. In addition, researchers have found that parents’ understanding of such curricula is incomplete. However, when given the opportunity to share their thoughts, many parents have responded positively regarding standards-based mathematics. Interventions designed to engage parents have yielded positive results, and researchers highlight the importance of including parents in various ways. My chosen intervention revolved around the notion that being present in the classroom would be valuable for parents.

The Reform Confuses Parents

The current reform to mathematics education includes “less emphasis on memorization of facts and rules, and greater emphasis on active engagement and problems set in realistic contexts” (Senk & Thompson, 2003, p. 12). These changes to mathematics classrooms are often confusing for parents. As mentioned previously, most parents of today’s elementary school students learned math through more traditional approaches.

In my experience, parents who are confronted with standards-based curricula in their children’s classrooms become confused. Educational research has explored this confusion. Abreu and Cline (2005) examined how parents’ own mathematical experiences affect their understanding of the constructivist manner in which their
children were learning in school. Through interviews, Abreu and Cline found that parents were “often confronted with differences between their own ways of tackling mathematics and what the children had learned at school. Only 5 of the 24 children’s parents saw their own and their children’s school mathematics as the same” (p. 703). Specifically, parents identified teaching methods, teaching tools and strategies as major differences between home and school mathematics. Abreu and Cline claim that this discrepancy between home and school causes parents to experience difficulty negotiating school math with their children. This struggle is well documented in the following study.

Remillard and Jackson (2006) interviewed ten mothers regarding their response to the use of Everyday Mathematics in their children’s classrooms. They hoped to discover how these parents viewed mathematics and how they made sense of the curriculum and instruction their children experienced. The parents interviewed by Remillard and Jackson “tended to have a broad view of mathematics as it applied to their daily lives and, at the same time, a narrow view of school math” (p. 242). Their concept of school math was mainly based upon their own traditional mathematics backgrounds. “When speaking of their own experiences with school mathematics, 7 out of 10 parents focused almost solely on computational skills” (p. 242). In addition, most parents expressed negative memories of learning mathematics.

Remillard and Jackson (2006) report that “most of the parents that we spoke with found the new approach to math instruction more confusing than what they experienced as students” (p. 246). For example, Everyday Mathematics encourages students to use various approaches to solve problems. Parents expressed their belief that utilizing one
method for solving a mathematical problem would be less complicated. Because of the vastly different approach to learning mathematics that *Everyday Mathematics* presented, these parents did not feel well equipped to help their children with school math. In fact, all of the parents interviewed “found themselves teaching their children the approaches they learned in school” (p. 251).

Remillard and Jackson’s (2006) participants had trouble bridging the gap between home and school math even though they strived to be resourceful and learn about the curriculum. Although parents in their study attended meetings, asked questions, and visited classrooms, they still felt unprepared to support their children with school math. Remillard and Jackson contend that parents feel helpless because they do not have access to the discourse of reform and are “expected to support their children’s learning of mathematics in ways that do not make sense to them” (p. 256). They call for school districts to create opportunities for parents to learn about the mathematical approaches endorsed by standards-based curricula and the goals behind mathematics reform. Remillard and Jackson believe that allowing parents access to the discourse of reform is necessary for its success.

**Parent Participation Not Encouraged**

Researchers have shown that educators do not encourage parents to participate in their children’s learning of standards-based mathematics. Peressini (1998) reviewed the literature in order to determine the ways in which parents have been positioned by educators when it comes to math reform. He argues that there is a negative portrayal of parents in standards-based mathematics education documents. Peressini claims that this
negative representation affects the practice of mathematics educators by setting the tone for how parents are treated in schools. Specifically, he found that parents were rarely mentioned in the documents of the 1980s. Although parents and their roles were discussed increasingly in the literature of the 1990s, Peressini found that “these documents typically characterize parents as obstacles to the overall effort to improve schools” (p. 565). He claims that this negative depiction has been an influential factor in the exclusion of parents when it comes to standards-based mathematics education.

Research has also argued that standards-based curriculum materials do not encourage teachers to include parents in their children’s learning. Gellert (2005) analyzed a parent letter included in the curricular materials of a German reform mathematics program, *Das Zahlenbuch* (Berger et al., 1998). His goal was to uncover the role assigned to parents by such curricular documents. He argues that parents are requested to leave the work of teaching to the experts, those that are aware of current mathematics pedagogy. The letter states, “The *Zahlenbuch* has been constructed according to modern knowledge on teaching methods, but in a different way to which you will be familiar with from your own school days” (p. 319). Curriculum authors understand that the methods utilized in *Das Zahlenbuch* are most likely new to parents. However, no attempt is made to include parents in the discourse of reform. Gellert states that “knowledge of teaching and learning methods is considered, and depicted, as outdated-and no attempt is made to update the parents’ understanding…They become excluded from the process of educational change” (p. 322). This stands as a clear
example of parents being left out of the reform process. Although this work was conducted in Germany, the following study reported similar findings in the United States.

Epstein and Jackson (2006) analyzed the parent components of two standards-based mathematics curricula. They chose *Everyday Mathematics* and *Investigations in Numbers, Data, and Space* (TERC, 1998), claiming that they are the standards-based programs most often adopted at the elementary level. Researchers commended the efforts made by curricular authors of both publications to involve parents since they both provide materials that are designed to assist parents as they work with their children. However, Epstein and Jackson question the level of accessibility for parents. Firstly, based upon their analysis, they found that the readability of the documents is most likely problematic for parents with limited literacy skills or English proficiency. In addition, researchers argue that many parents will have difficulty enacting the roles that are suggested for them. For instance, they claim that:

> When parents are asked to be instructors, the materials assumed that parents had a relatively solid mathematics education background; in most cases it was assumed that a parent should understand a particular concept with little explanation. Further, most of the materials assumed that the parents were familiar with reform-oriented ways of teaching mathematics. (p. 21)

Thus, parents may not have access to the ways in which they are encouraged to participate. Although parents seem to be given active roles, Epstein and Jackson argue that they are not equipped to take advantage of them.

Researchers argue that continuing to ignore parents will be detrimental to the success of mathematics reform (Abreu & Cline, 2005; Graue & Smith, 1996; Lehrer & Shumow, 1997; Lubienski, 2004; Peressini, 1996; Remillard & Jackson, 2006; Shumow,
For example, Lubienski’s (2004) work examined how the exclusion of parents affects enrollment in math courses. She surveyed students and parents in an Iowa public school district offering students two choices for their high school math course sequence, traditional or standards-based. Although the district encouraged families to choose standards-based math courses, “less than 18 percent of the 600 eligible students enrolled” (p. 349). Lubienski found that, for many parents, the tradition of taking algebra courses was deeply embedded in their ideas about solid math preparation. The parents were also concerned about colleges viewing standards-based courses negatively. Lubienski claims that this case of resistance “challenges the notion that students and parents will be ‘won over’ after several years of Standards-based instruction” (p. 361). She believes that school districts need to actively involve parents by creating opportunities for them to gain a deeper understanding about mathematics reform.

Researchers also argue that this exclusion of parents has created a disparity between home and school math that has a negative effect on student learning (Abreu & Cline, 2005; Lehrer & Shumow, 1997, Shumow, 1998). Abreu and Cline (2005) argue that parents experience difficulty negotiating school math with their children. For example, parents expressed concerns that the use of calculators interfered with the development of children’s ability to calculate mentally. Some parents discouraged the use of calculators at home. Many also encouraged their children to memorize times tables rather than use a calculator, a practice not utilized in school. Abreu and Cline speculate that such disparity widens the gap between home and school math and has a negative effect on students. They found that high-achieving students were able to
navigate between home and school mathematics successfully. However, this difference between home and school math caused confusion for low-achieving students.

**Parents' Encouraging Views**

When given the opportunity to learn about standards-based approaches, parents have expressed positive feelings toward them. For example, Shumow (1997) interviewed parents in communities that appeared to be resisting math reform. Specifically, she examined parents' beliefs about the goals of schooling, learning processes, teachers' roles, assessment, and parents' roles. She states that “it is important to learn more about such parent beliefs at this time in which educators advocate widespread reform of curriculum, instruction and assessment predicated on constructivist epistemology” (p. 38). Shumow argues that parents are important agents in the schooling process and should be included as partners in their children’s education. However, she claims that as reforms have been put into place, school districts have ignored parents for a variety of reasons. Shumow contends that in the rare cases where parents are involved in the process of reform, only a small group of parents participate. She makes a case for “the importance of garnering views from a spectrum of parents, as well as understanding the grounds on which parents base their beliefs and the motives that they express for their views” (pp. 38-39). In her opinion, this would give the reform its best chance to succeed. Based upon her findings, presented below, she claims that “schools have much to gain by talking with a broad sample of all parents, rather than by changing policy or shutting parents out because of generalizations or fear based on complaints made by a small minority of vocal parents” (p. 46).
Shumow (1997) found parents' views to be inconsistent with the goals of reform. Instead, she found that most parents in her study (60%) named transmission of basic skills as the most important goal for schooling. This directly contrasts with the constructivist nature of the current mathematics reform. However, she also found that parent beliefs were consistent with the means of reform. For instance, the majority of parents held beliefs about the process of learning that aligned with the reform. Although many parents stated their approval of traditional methods such as drill and practice, others embraced more constructivist learning experiences. In addition, “parents’ ideas about the role teachers should play in the classroom also tended to be consistent with those of the reforms” (p. 42). Specifically, utilizing background knowledge and real-world contexts were two strategies parents identified for effective teaching.

Shumow (1997) concluded that parents view standards-based math teaching and learning positively, but continue to be unsure about its goals. She believes that increasing contact between families and educators is essential for parents' understanding and reform success. To this end, Shumow advocates “increased communication and sharing among parents and teachers about children’s learning, adjustment, and progress, as well as representation of children’s home experiences in school” (p. 47). This concept represents a two-way model of home to school contact that focuses not only on how students are doing in school, but also on what they are doing at home.

Lehrer and Shumow (1997) conjecture that aligning the “construction zones” of home and school is necessary for reform success and student success. They claim that parental participation within standards-based mathematics is strained due to the
misalignment between home and school. Lehrer and Shumow conducted three studies. The first was a naturalistic study designed to “examine parents’ beliefs about teaching practices in reform mathematics classrooms” (p. 46). Their work was set in a community experiencing negative reaction to educational reform. Thus, researchers believed that parents would react unfavorably to standards-based mathematics pedagogy. Lehrer and Shumow identified eight practices that were commonly used in the classroom, such as invented algorithms and cooperative group work. They showed parents videotapes depicting each of these classroom strategies.

Through parent interviews, Lehrer and Shumow (1997) found that “most parents accepted or even endorsed classroom practices designed to promote greater mathematical understanding” (p. 72). For instance, parents supported conjecturing and using multiple strategies as practices in mathematics classrooms. Learning through small groups and through discussion received the most negative responses. Lehrer and Shumow conclude that parents regard standards-based mathematics pedagogy positively and they highlight the importance of giving parents opportunities to view such teaching practices.

Lehrer and Shumow (1997) also found that the parents in their study did not hold beliefs that were “organized in ways that one could describe as a personal theory of mathematics education” (p. 54). Although these parents were receptive to standards-based teaching methods, their concept of math education was disorganized. For example, many parents endorsed the use of hands-on strategies. However, they envisioned utilizing such methods to support the use of traditional mathematical algorithms. This fragmented theory of mathematics education is understandable given the vast difference
between the way parents were taught and the constructivist manner in which their children were learning. Lehrer and Shumow claim that this confused view of mathematics pedagogy negatively affects parental participation. Specifically, they argue that parents will be limited in the ways in which they engage their children in mathematics at home.

Peressini (1997) also interviewed parents regarding mathematics reform. He conducted his work in correlation with the School Level Study of Mathematics Reform by the National Center for Research in Mathematical Sciences Education. Peressini found that most parents responded positively to the changes in mathematics education: "by and large, parents were impressed by, and supportive of, these changes" (p. 422). However, he also found that parents were unsure of the goals of mathematics education reform. In addition, Peressini highlights the areas in which parents remain concerned. For instance, many parents expressed confusion about how to help their children with homework and often felt that their children were not practicing important mathematical skills adequately. Peressini believes that increased parental participation will lead to increased support of math reform:

As parents become more involved in their children’s mathematics education, their understanding of the changes occurring in school mathematics increases. As a result, they begin to support and enhance their school’s efforts to reform their mathematics programs. (p. 427).

It is unclear how Peressini arrives at this theory. It does, however, capture the importance he places upon parental participation in the reform of school mathematics.
Peressini’s (1997) findings parallel the conclusions drawn by Shumow (1997) about parents supporting the means of math reform, but being uncertain about the ends. Both researchers highlight the need for educators to look for ways to involve parents more effectively.

Positive Results of Intervention Studies

Researchers have attempted to involve parents in their children’s math learning through intervention studies. Some of these studies focus primarily on increasing parents’ level of involvement. Others aspire to increase parents’ understanding of the ideas behind the reforms. In addition, there is a small body of work that utilized parent observation as a tool for increasing parent involvement and understanding. All of these studies have produced positive findings, concluding that attempts to involve parents have varied benefits for parents, students and educators.

Sheldon and Epstein (2005) surveyed eighteen schools involved in a large research project studying the effects of school and community partnerships on students. These schools were implementing various activities in order to increase the participation of families and other community members. One of Sheldon and Epstein’s research questions was, “What is the relationship between the implementation of specific family and community mathematics involvement activities and changes over time in school reports of student performance on mathematics achievement tests?” (p. 198). Researchers analyzed various activities undertaken by schools to determine whether they correlated with student improvement in mathematics. These practices included holding math workshops for parents, increasing communication with families, requesting
volunteer tutors and assigning home-based activities. Survey findings suggested that “mathematics-focused, learning-at-home activities consistently and positively related to improvements in the percentages of students who were proficient on mathematics achievement tests” (p. 204). These activities were most commonly homework assignments and informative mathematics resources for use at home. Researchers concluded that engaging families in mathematics tasks at home was valuable for students.

Similar intervention studies aimed at increasing parents’ involvement have been conducted by practitioners working in the field. For example, Linda Carey (1998), a second grade teacher who worked with inner city students, planned and implemented her own parental participation program in mathematics. In her quest to bolster students’ confidence and scores on state proficiency tests, she decided to involve parents in student learning by sending home math manipulatives and extra math packets for families to complete. She called her program “Parents as Partners,” envisioning parents as partners in their children’s math education. Scores on state tests revealed that 77 percent of the students exhibited mastery in the concepts upon which Carey focused (compared with 50 percent who demonstrated mastery on a pretest).

Carey (1998) claimed that involving parents in her students’ math learning had a positive effect on both students’ and parents’ confidence. For students, “those few minutes of personal parental attention truly helped build their self-esteem as well as their confidence in the mathematics they were doing every day in class” (p. 318). Carey speculated that parents’ interest in the mathematics their children were learning caused
the students to assign a greater importance to it. The parents who participated in Carey’s project expressed gratitude and encouraged Carey to continue the program.

Carey’s (1998) categorization of parents as partners in their children’s education represents a way of regarding parents as resources. This stands in stark contrast with the negative view of parents that Peressini (1998) and others have documented. This move toward utilizing parents as resources for their children is an important element of some of the most recent work in this area. The following studies envision parents as resources, attempting to increase parents’ understanding of the ideas behind standards-based mathematics.

Shumow (1998) designed and implemented an education program for second grade parents. She argued that parents’ own experiences with traditional approaches to mathematics education cause them to work with their children in a “directive-controlling manner” that is inconsistent with standards-based methods. Shumow believes that “accurate parental knowledge of children’s cognitive level appears to result in better fitting interactions with the child” (p. 111), what she calls “parental attunement.” The more a parent understands her child’s cognitive reasoning, the better prepared that parent is to assist with the learning of mathematics. Thus, the main objective of her study was to attune parents. Shumow sent home newsletters and extra homework for families to complete and return to school. The newsletters contained “information about the development of children’s mathematical reasoning” (p. 113).

Shumow (1998) focused her findings on the way in which parents monitored and worked with their children. Families were videotaped and parental assistance was coded
for the level of parent control and the type of assistance provided. She found that parental assistance categorized as highly controlling decreased as parents participated in the study. In addition, less controlling forms of assistance increased. Thus, parents began working with their children in less controlling ways. Shumow concluded that:

Parents who participated in the parent education program changed from being directive and controlling of their children’s solutions to providing more assistance that supported children’s self-regulation and kept children constructively involved in problem-solving. (p. 123)

This parent education intervention caused parents to work with their children in a manner more consistent with the way they were learning at school. Shumow claims that this is not only beneficial for students, but also necessary for the success of math reform.

A prime example of viewing parents as resources is the work of Marta Civil and her colleagues involved in Math and Parent Partnerships in the Southwest (MAPPS). They argue for a new approach to parents when it comes to standards-based mathematics education. First and foremost, they call for educators and administrators to stop upholding a deficit view of parents. They undertake their work with minority populations, who they claim are often considered to be hindrances to their children’s education.

Civil (2001) argues that parents want to learn more mathematics so they can help their children. MAPPS is designed to work toward this goal. Implicit in this project is an underlying assumption that, as they learn mathematics, parents will be empowered to participate actively in their children’s education. Civil states the main objective of MAPPS:
To establish a two-way conversation in which parents learn about the current mathematics reform efforts (by doing mathematics themselves) and we learn about their perceptions about their children’s education and about their beliefs about and uses of mathematics. (p. 1)

MAPPS utilizes three components: leadership sessions, math workshops, and math courses. Math courses provide opportunities for parents to strengthen their mathematical understanding. In order to empower parents to assist their children with standards-based mathematics, courses focus on “tasks that one would see in mathematics classrooms that have adopted standards-based curricula” (Civil & Bernier, 2006, p. 311). Thus, these researchers created a space for parents to learn mathematics the way their children are learning in school.

MAPPS researchers conjectured that learning mathematics in a constructivist manner would enable parents to act as intellectual resources for their children at home. They found that parents gained not only mathematical content knowledge, but also confidence in their abilities. In addition, parents felt that their children viewed them as resources as a direct result of attending MAPPS math courses. Based upon these findings, researchers concluded that “giving parents opportunities to actively construct their own understanding of mathematics concepts provides a critical foundation for their work with their own children” (Civil, Guevara, & Allexsaht-Snider, 2002, p. 1762).

Another important element of the research conducted by those involved in MAPPS is that of classroom observation. This will be discussed below.

Jackson and Remillard (2005) call for this same depiction of parents as intellectual resources that Civil and her colleagues advocate. In their work with parents,
Jackson and Remillard explore “the ways parents can and do act as resources for their children’s education” (p. 52). This work was discussed in detail above (see Remillard & Jackson, 2006). This research highlighted both formal and informal learning opportunities that parents created for their children at home. Researchers found “creative and deliberate ways that parents were involved in their children’s education, including ways that may have been overlooked by other studies of parent involvement” (p. 67). Jackson and Remillard promote a broader view of parent participation, one that encompasses time out of school and activities initiated at home.

Jackson and Ginsburg (2008) designed and held math workshops for parents, highlighting the “importance of framing parents as learners, or as intellectual beings, in addition to identifying them as supports for their children” (p. 20). Workshops were based upon Everyday Mathematics, the standards-based curriculum adopted by the chosen school. By focusing on parents as resources, Jackson and Ginsburg uncovered phenomena that may have otherwise been overlooked. For example, parents’ questions were found to significantly influence the workshops:

Participants developed an understanding of the content at hand because they asked questions and made observations (solicited and unsolicited) throughout the classes. And, their questions and observations often pushed us as instructors to change the direction we had intended to take during a class period, and instead to engage the learners in sequences of activities that were more challenging than we had initially intended. (p. 10, italics in original)

Researchers found that the mothers began to develop “an additional purpose for attending class - to intellectually engage in mathematics for the sake of doing mathematics” (p. 17). Jackson and Ginsburg intended for the math workshops to assist parents as they helped
their children with schoolwork. They argue that these mothers assigned new meanings to the courses and became algebra learners. Some even claimed to find enjoyment in mathematics for the first time. These findings depict parents as intellectuals and emphasize the importance of viewing them as such.

The above studies represent a movement toward viewing parents in a supportive manner. Not only do the researchers cited recognize that parents are important agents in their children's education, but also they categorize them as intellectual resources. My intervention study involved parents being present in the classroom, something that very few researchers have studied. In my opinion, this is an important part of the puzzle that is missing from the majority of the literature. What follows is a review of the few pieces that do incorporate parent visitation.

As previously mentioned Lehrer and Shumow (1997) created videotapes of common standards-based mathematics practices and showed them to parents. Interviews revealed that parents are receptive to these approaches to mathematics, such as invented algorithms. Lehrer and Shumow suggest that viewing standards-based teaching practices can help parents begin to understand them. However, the program developed by these researchers to involve parents did not include visits to the classroom. Videotapes may have provided more flexibility for parents. However, watching a videotape gives parents only one job, to observe. My intervention took this one step further by inviting parents into my standards-based classroom. Parents were able to not only observe, but also to participate and learn.
Peggy Scott (2007), a school principal, documented her school’s project aimed at involving parents in the mathematics classroom. Although this piece is not an example of scholarly research, what she found as a result of inviting parents into the math classroom has an important place in this discussion. Teachers were initially unsure about the program, but after participating they “expressed surprise at the respect, sensitivity, and enthusiasm the parents brought to their classrooms” (p. 49). Parents felt valued and gained an appreciation for the difficulty teachers face each day. Perhaps most in line with this dissertation, Scott claimed that her project was “a beginning in seeing past parents’ demands and establishing practical and respectful ways for teachers and parents to work together” (p. 49).

The best model of an intervention study incorporating parent visits to the classroom is provided by Anhalt, Allexsaht-Snider and Civil (2002), three of the researchers involved in the MAPPS project discussed above. Their work was done in middle school mathematics classrooms embracing reform. They claim that reform documents rarely suggest that parents should be encouraged to visit classrooms. These researchers speculate that observing lessons is an important and effective way for parents to gain a deeper understanding of mathematics reform. Researchers addressed three questions:

(a) What were the parents’ concerns and expectations of the mathematics lessons at the middle school level?  (b) What mathematics content were the parents already familiar with at the middle school level, and what mathematics content was new to the parents?  (c) What perspectives did parents develop from observing reform mathematics lessons and comparing them to their own mathematics education?  (p. 256)
Anhalt, Allexsaht-Snider and Civil (2002) interviewed parents before and after classroom visits. Prior to their visits, parents and the facilitator “met to discuss questions of interest to the parents. They also discussed the objectives of the lesson they were about to observe” (p. 258). Parents expressed interest (and concern) regarding teachers’ instructional approaches.

During the observation, parents participated in the lesson by joining groups of students. After the visit, parents had the opportunity to speak with the teacher and they had additional conversations with the facilitator. “Parents noted new roles for teachers and students in the mathematics classrooms” (Anhalt, Allexsaht-Snider & Civil, 2002, p. 260). They also noticed students collaborating in positive ways.

With regard to parents, Anhalt, Allexsaht-Snider and Civil (2002) conclude that “through observing reform mathematics instruction in action, they were becoming aware of important elements of reform pedagogy” (p. 260). In addition, researchers highlighted the importance of offering parents access to information about standards-based mathematics education in interactive ways, such as observing lessons. They speculate that such participation can assist parents as they work with their children and as they support teachers’ efforts.

Many parents do not understand the ideas behind standards-based mathematics education. Instead of being embraced by educators, parents have been viewed as obstacles and have not been given opportunities to understand and engage in standards-based mathematics. However, research has shown that some parents are enthusiastic about the changes to mathematics education in their children’s classrooms.
The positive findings presented by intervention studies in this area are encouraging. From such studies, educators have learned that many parents are open to assistance and to new ways of approaching mathematics with their children. When given the opportunity and support, parents embrace standards-based math. Further, Shumow (1998) found that parents benefit psychologically as they become more involved in their children’s math learning.

MAPPS is an example of an intervention focused upon engaging parents in various ways with standards-based math. Among these is an opportunity for parents to visit and participate in standards-based lessons in math classrooms (Anhalt, Allexsaht-Snider, & Civil, 2002). Parents who visited classrooms gained a greater understanding of standards-based approaches to teaching and learning and were able to use this newfound knowledge to work with their children at home.

My study was designed to create an opportunity for parents similar to the one Anhalt, Allexsaht-Snider and Civil (2002) studied. The intervention was unique given the lack of research in which parents spend time in standards-based classrooms. It will add to Anhalt, Allexsaht-Snider and Civil’s findings around what parents learned while experiencing math lessons and how they utilized this knowledge.

**Conceptual Framework**

The literature in the area of parents and standards-based mathematics influenced the development of the conceptual framework for this study. Researchers have studied parents and their feelings toward standards-based curricula in an effort to figure out how to support them (Lehrer & Shumow, 1997; Peressini, 1997; Shumow, 1997). These
studies found that parents are generally supportive of the reform, but do not fully understand it. I wondered if I would find the same phenomenon at Monroe. My questionnaire uncovered Monroe parents' feelings toward and beliefs about standards-based math. This information served as a starting point and allowed me to document the changes that parents experienced. By understanding some of the parents' beliefs, I was also able to design the intervention around them. For instance, I noted that many parents did not endorse the use of manipulatives in fourth grade. Thus, I made it a point to invite parents to attend lessons based on their use. And, during parent interviews, I focused on whether or not parents' beliefs changed after their visits.

As documented in the review of literature, studies aimed at increasing parental participation with standards-based mathematics have yielded positive results for parents, students and teachers. However, there is a lack of research in which parents visit the standards-based classroom. The best example I found was that of Anhalt, Allexsaht-Snider and Civil (2002). They concluded that parents gained insight into standards-based mathematics as a result of participating in lessons. For my study, being present in the classroom allowed parents to observe, participate, reflect, listen and learn. As a result, I found that parents changed in many ways.
Figure 1: Concept Map

**Parents' Beliefs**
- Views on how math is learned
- Views of EM
  
**Affected by:**
- Parents’ math background
- Past experience with EM

**Influence**

**Parents’ Actions**
- Actions taken at home regarding math
  
**Affected by:**
- Level of engagement with children’s education
- Intervention

**Changes Documented**
- Understanding of EM
- Understanding of mathematics
- Level of appreciation for EM
- Beliefs about math teaching and learning
- Actions taken at home with children

**Intervention**

Key activities:
- Observing the teacher’s role in a standards-based classroom
- Listening to children discuss mathematics
- Reflecting on the lesson in written form (parent journals) and orally (interviews)
- Observing the use of (and using) math tools
- Observing students working together (and working with them)
Figure 1 provides a visual representation of the conceptual framework for this study. The box labeled "Parents' beliefs" represents parents’ beliefs about both mathematics education and *Everyday Mathematics*. Inside the box are two factors that research findings and my experience suggest act as influences upon parents’ beliefs. These are: a) parents’ past experiences with their children’s math learning at Monroe and b) parents’ own mathematics education. An additional factor that I found to affect their beliefs was the parent visitation intervention.

The box labeled "Parents' actions" represents the actions parents take at home in regard to their children’s math education. These actions are affected by parents’ overall level of engagement with their children’s learning. I also assert that parents’ actions were influenced by the intervention. As depicted in the concept map, parents’ beliefs influence their actions (this will be discussed in the theoretical framework below).

The box labeled "Intervention" represents the program of parent visitation and participation that I created and studied. The key activities of the program were based upon fundamentals of the *Everyday Mathematics* program that were highlighted during classroom visits. The classroom components chosen are also grounded in research that examined parents’ beliefs. For instance, listening to children discuss mathematics is one of the listed activities. Lehrer and Shumow (1997) found that parents were skeptical of whether or not their children benefited from learning through discussion. Other key activities include observing the teacher’s role and reflecting on the lesson (Anhalt, Allexsaht-Snider & Civil, 2002), observing the use of math tools such as calculators.
(Abreu & Cline, 2005), and observing students working in groups (Lehrer & Shumow, 1997). These activities served as guides for choosing lessons for visitation days.

The conceptual framework for this study is rooted in the changes that participants experienced over time. This is represented in the concept map by the area in the middle called “Changes Documented” around which the aforementioned boxes revolve. The process of change that participants experienced was cyclical. Parents’ beliefs and actions affected the way they participated in the study. In turn, the intervention challenged parents’ beliefs, influencing their actions. The relationship between actions and beliefs is revisited in the theoretical framework and in the concluding chapter.

Theoretical Framework

The theoretical framework for this study draws on literature from the field of education in three areas. Constructivist theory provides a lens for the design of the visits and for examining the changes parents experienced as they participated in the study. Research on how beliefs can affect actions will be used to support my claim that, as parents’ beliefs changed, their actions changed as a result. Finally, literature on teacher research will serve to uphold my methodological choice to conduct work in my classroom.

Constructivism

Reform-based mathematics curricula are based upon constructivist theories of learning (Senk & Thompson, 2003). Therefore, the constructivist view of teaching and learning is inherently incorporated into this study. More importantly, however,
constructivism serves as a framework for both the process of learning and the process of change that participants experienced.

Constructivism is typically described as a theory of learning focused on the notion that knowledge is actively constructed by learners (Huang, 2002). For the most part, this theory is based upon the work of Jean Piaget. Piaget used the terms assimilation and accommodation to describe the process by which learning happens. According to his theory, experiences are assimilated into our understanding through accommodation, the process of change to one’s cognitive structures. Muuss (1988) elaborates:

Assimilation and accommodation are complementary processes...It is through this process of assimilation and accommodation that the intellectual structure expands. When a balance between assimilation and accommodation has been accomplished, a state of equilibrium exists. (p. 179)

New experiences that conflict with a person’s understanding cause what Piaget called disequilibrium. “Contradiction between the learner’s existing understanding and what the learner experiences gives rise to disequilibration, which, in turn, leads the learner to question his or her beliefs and try out new ideas” (Palincsar, 1998, p. 350).

My study participants most likely learned math through procedure-focused teaching approaches. For this reason, participating in the key activities of the intervention (as discussed in the conceptual framework) conflicted with their understanding of mathematics. According to Piaget, it is this conflict that led the parents to attempt new approaches to math and change their beliefs about mathematics education. It is this process of disequilibration that I captured (and depict in Chapter 5) through my various data sources.
Since the participants for this study were parents, it is important to determine the effectiveness of constructivist teaching methods for adult learners. To this end, Huang (2002) compared modern adult learning theories with constructivist theories of learning. He argued that both sets of theories emphasize similar elements of effective learning environments. For instance, "constructivist theory emphasizes that learning should be authentic" (p. 33). According to Huang, adult educators also emphasize the importance of authentic learning. Huang continues to elaborate on the parallels between constructivist techniques and adult learning theory such as collaborative, student-centered teaching approaches. This work serves as evidence that constructivist learning theories are highly appropriate for mature learners.

Spigner-Littles and Anderson's (1999) work identifies constructivist approaches to instruction that they found to be beneficial for adult students. They suggest that teachers of older students should act like facilitators. This is a paradigm of teaching often found in standards-based mathematics instruction. Spigner-Littles and Anderson also emphasize the importance of techniques such as "utilizing effective questioning styles, encouraging cooperative learning, utilizing discussion groups, and encouraging the students' active involvement" (p. 207). The constructivist approaches promoted by these researchers are comparable to methods emphasized by standards-based curricula such as Everyday Mathematics. Therefore, based upon the findings of these researchers, the learning environment that I strive to create in my math classroom every day for students is also conducive to adult learning.
The constructivist approach to teaching has also been found to be an agent for change. For this study, as parents constructed knowledge in the classroom, their beliefs about mathematics education changed. McAuliffe (2002) studied adult students as they prepared to become counselors. Overall, the students learned to be more reflective and autonomous. They also developed a newfound appreciation for dialogue. McAuliffe studied the influences, as identified by students, upon these changes. He found the social construction of knowledge to be one of four major influences. Specifically, "involving students in knowledge creation" (p. 209), focusing on peer interaction, and "introducing multiple perspectives" (p. 209) were identified by students as links to the changes they experienced. These constructivist techniques assisted students as they became professionals in their field. McAuliffe's work creates a connection between constructivism and personal growth, or change. This is a link I recreated in my study.

Beliefs and Actions

As noted by Palincsar (1998), disequilibration caused by new experiences can lead one to question his/her beliefs. As parents in this study participated in reform-based mathematics lessons, their beliefs about mathematics teaching and learning were challenged. One of the goals of this study was to explore the relationship between parents' beliefs and their actions. As depicted in the conceptual framework, I speculated that parents' beliefs about mathematics and math education would influence their actions. (For the purposes of this study, the ways in which they worked with their children at home represented their actions.)
There is a body of research that explored parents’ beliefs regarding reform mathematics. These were discussed above in the review of literature. However, there is very little work that examines the relationship between parents’ beliefs about reform mathematics and their actions. Lubienski (2004) studied how parents’ ideas about mathematics education affected the courses in which their children enrolled. As described above, many parents in this study believed that traditional math courses were an important part of solid high school preparation. This led parents to encourage their children to enroll in such courses. Thus, Lubienski argued that parents’ beliefs played an integral role in their participation.

Lynch, Anderson, Anderson, and Shapiro (2006) studied the relationship between parents’ beliefs and their actions. Their work is based upon literacy education; however, it has implications for other areas. For instance, these researchers claim that “if a relationship exists between parents’ beliefs and behaviors, then educators who want to influence the types of activities parents engage in with their children may need to consider parents’ beliefs” (p. 2). My study was based upon the notion that parents have difficulty becoming involved in their children’s learning of reform mathematics. Lynch et al. suggest that it is important to take parents’ beliefs into account when attempting to influence the ways in which parents participate in their children’s education. This argument supports my decision to examine parents’ beliefs in an ongoing manner.

Lynch et al.’s (2006) findings support my hypothesis that parents’ beliefs affect their actions. They claim that “parents act or intend to act in a manner consistent with their beliefs. This study found a relationship between parents’ literacy beliefs and the
behaviors they engage in to help their children learn to read and write" (p. 13). If my conjecture that parents hold negative views of reform mathematics education is correct, parents' participation in this area will not align with reform methodologies. Lynch et al. suggest that the more teachers know about parents' beliefs, the more we can work toward aligning home and school. This was one of my goals for the intervention.

Thompson (1984) also found that beliefs affect actions. Her work was completed in the area of mathematics education; however, it was done with teachers. She conducted case study analyses of math teachers in order to identify key factors that appear to influence instruction. Based upon the matches between teachers' beliefs and their practice, she argues that:

Teachers' beliefs, views, and preferences about mathematics and its teaching, regardless of whether they are consciously or unconsciously held, play a significant, albeit subtle, role in shaping the teachers' characteristic patterns of instructional behavior. (p. 183)

Although this work focused on the beliefs of teachers, it can be readily applied to parents. Similar to Lynch et al.'s finding, Thompson's argument is that beliefs shape actions. When applied to parents, beliefs about mathematics may affect the ways in which they participate in their children's mathematics learning. This implication that beliefs affect actions suggests that there may be an interesting connection between them.

More specifically, when it comes to standards-based mathematics, teachers' beliefs have been found to play a noteworthy role in their actions. Lambdin and Preston (1995) studied how teachers utilized a standards-based curriculum that they agreed to field test in their classrooms. They found that teachers had varied responses to the curriculum. “Some found the innovation a close match to their personal philosophy and
made very smooth transitions” (p. 130). Others found the change to be very difficult. Lambdin and Preston conclude that the closer the link between teachers’ beliefs about good math teaching and the curriculum’s philosophy, the easier the transition was. Although this research was done with teachers, the argument can be applied to parents as well. For the purpose of this study, I speculated that visiting the classroom would assist parents in their understanding and acceptance of reform mathematics. This, in turn, would make it easier for them to actively participate in their children’s learning, especially at home.

Manouchehri and Goodman (1998) also explored the link between teachers’ beliefs and their actions. Specifically, they studied teachers in order to determine what aided or impeded their implementation of standards-based mathematics curricula. Manouchehri and Goodman argued that “the more experiences that the teachers had teaching with traditional approaches, the more they questioned the value and relevance of the programs” (p. 32). This skepticism caused teachers to use the reform-based curricular materials inconsistently. The more deeply ingrained teachers’ views of math teaching, the harder it was for them to change.

This case of reluctance to implement reform can be easily related to parents. It is similar to the phenomenon that Lubienski (2004) uncovered. She claimed that traditional views of mathematics interfered with parents’ ability to choose standards-based high school courses for their children. She argued that this resistance to reform will not simply disappear with time. Her recommendation for school districts was to find ways to
involve parents. My study was designed to not only involve parents, but also to challenge their beliefs about mathematics teaching and learning.

Teacher Research

The methodological choice to conduct research in my fourth grade classroom was one about which I felt strongly. Throughout my studies, the theoretical background provided by my coursework supported my daily practice as a teacher. In turn, my classroom was my practical outlet. I was able to remain grounded in the day-to-day work of teaching while immersed in my studies. As a result, my outlook on research and theory was to determine their direct applications to the classroom. Therefore, conducting this study in my classroom was a logical choice.

Cochran-Smith and Lytle (1993) define teacher research as “systematic and intentional inquiry carried out by teachers” (p. 7). The term systematic is used to refer to “ordered ways of gathering and recording information, documenting experiences inside and outside of classrooms, and making some kind of written record” (Cochran-Smith & Lytle, 1992, p. 450). In addition, they use the term intentional to signify that the research is planned. I argue that my study embodies this definition of teacher research.

According to Cochran-Smith and Lytle (1999), the specific type of teacher research I conducted is practical inquiry. Researchers conducting this kind of work “assume that some of the most essential knowledge for teaching is practical knowledge…This approach to theorizing teacher research emphasizes that knowledge comes from reflection in and on practice” (p. 19). The inquiry upon which this study was based is one which comes directly from my practical experience working with parents.
Ball and Lampert (1999) studied their own classrooms in their quest to teach mathematics for understanding. They argue that:

Without a common context, it is possible for people to talk about teaching and learning without knowing whether they are agreeing or disagreeing about the meaning of terms, principles, and ideas. They can advocate for “hands-on” learning, “class discussion,” or “problem-based” instruction, and not realize how differently they conceive these. (p. 375)

This statement is at the heart of my inquiry. Parents are often confused about what constitutes standards-based mathematics education. In addition, it is my opinion that parents have little knowledge regarding what happens in the classroom. Even if they take advantage of opportunities such as Math Night, Meet the Teacher Night, and conferences, parents may still be conceiving of mathematics pedagogy very differently than I am. For example, as mentioned previously, Lehrer and Shumow (1997) found that parents’ beliefs about hands-on strategies within reform-based curricula were linked to traditional teaching methods. Ball and Lampert speculate that allowing others access to their classrooms can create “a common experience of classroom events” (p. 372). This is precisely what I did.
Chapter 3: Research Methodology

Due to the nature of the research questions, this study followed a qualitative research design. According to Freeman (1998), “Given a particular question, certain data will respond to it” (p. 74). He argues that a study's research questions drive the types of data a researcher must collect. The questions posed by this study focus on the changes parents experienced as they participated in a classroom visitation program. In order to answer such queries, I used primarily qualitative data collection techniques.

Another reason that this study followed a qualitative design is that it is a piece of teacher research. The data I collected represent a particular group of parents at a particular time and place. It is not intended to be generalizable. Rather, it will inform my practice. Qualitative approaches provide insights into people’s lived experiences. In this case, the methods I chose documented the changes parents experienced as they participated in the study.

The primary focus of this study was the teacher research-based intervention. This intervention consisted of bi-monthly parent visits to the classroom that began in November and concluded in June. The intervention was aimed at providing parents with opportunities to both observe and experience standards-based mathematics instruction (as it is practiced in my classroom). The study was designed to support parents in their understanding and appreciation of such instruction.

This study was deemed an intervention in that it focused upon creating (and documenting) change. To this end, I collected data that highlighted how parents experienced the intervention and how it influenced their beliefs and their actions.
Study Site

Hamilton School District is a public, suburban district a few miles outside of a major northeastern city. During the year of the study, the district served approximately 5500 students in five elementary schools, one middle school and one senior high school. Approximately five percent of Hamilton students qualified for free or reduced lunch.

My study took place in a fourth grade classroom at Monroe Elementary School during the 2009-2010 academic year. The Monroe building was quite new, having opened to students in January, 2009. The school served roughly 500 students in kindergarten through fifth grade during the year of the study. Approximately 93 percent of Monroe students were Caucasian, four percent were Asian, and two percent were African-American. Six percent of Monroe students qualified for free or reduced lunch.

At the time of the study, Monroe Elementary School had a positive reputation in the Hamilton community. For instance, as a result of successful special education programming, families with special needs children moved into the Monroe neighborhood. For the most part, the relationship between teachers and families was positive as well. The Monroe Parent Teacher Organization (PTO) was supportive of teachers and district curriculum. They provided teachers with a small stipend each year to buy necessary materials not provided by the district. Parents in the younger grades were often invited into the classrooms to volunteer. By second grade, this practice had diminished. By fourth grade, it was almost nonexistent. I contend that this absence from the classroom was detrimental to parents who wanted to be more involved in their children’s learning of mathematics, especially given the constructivist nature of the curriculum.
Prior to the start of this study in 2009, I had been a fourth grade teacher at Monroe for eight years. Fourth grade classrooms were not self-contained; students moved in groups to different teachers for the core subjects. Class size for regular education classes ranged from about 22 to 28 students. Each student was assigned to a homeroom class that was heterogeneously grouped. I met with my homeroom students each morning to complete tasks such as attendance and ordering lunch. We also joined together in circle each day, guided by the principles of a social curriculum geared toward developing good working relationships amongst teachers and students. In addition, I taught science and social studies to my homeroom class.

In fourth grade language arts classes, students studied reading, writing, spelling, phonics, speaking and other related skills. These classes were composed based on ability. Students were identified (by various methods including teacher input, testing, and performance) as either grade level, above grade level or below grade level. Classes were grouped accordingly and those classes that required extra support received it from a reading specialist, a special education teacher, or the gifted teacher.

Finally, most math classes were grouped heterogeneously, although there was one accelerated class. Students were placed in math classes using third grade test scores and teacher input. The research I conducted took place in my heterogeneously-grouped 2009-2010 class. There were six students who received Title 1 support for mathematics. As a result, the Title 1 professional came to my classroom two days a week to support instruction. She also worked with Title 1 students twice a week outside of the classroom to provide extra practice.
Population

This study was designed to examine parents’ experiences while participating in a program of classroom visitation. Therefore, I invited the parents of every 2009-2010 Monroe fourth grader to take part in my study. There were approximately 100 students in fourth grade that year. I corresponded with parents via letters home, emails, informal conversations, phone calls and notes (often written in student assignment books).

The sample of parents that participated was dependent upon a number of factors beyond my control. In my experience at Monroe, many children came from families with two working parents. This most likely caused a problem for my sample size. I received various notes and emails from parents wishing me luck and lamenting that they were unable to come to math class due to work schedules. For example, one parent whose daughter was in my math class worked at a preschool part time. Unfortunately, she was at work while we had math class. She did come to visit once and commented that she was sorry she could not have come more often. The interview we shared after her visit was full of wonderful detail and interesting insights. Not being able to include this parent in the core group was a missed opportunity that was unavoidable.

The sampling I did for this study had an element of convenience; participants were chosen based upon their availability at a certain time. Merriam (1998) claims that such sampling “is likely to produce ‘information – poor’ rather than ‘information – rich’ cases” (p. 63). I acknowledge that, being constrained by a certain schedule, I missed the opportunity to learn from (and with) many parents. However, as will be argued below, I believe this study produced a great deal of rich information.
Parents of students in the upper grades were not given many opportunities to be active in the classroom during my years at Monroe. Now that I have conducted my study, I wonder if this affected my sample size as well. I attempted to recruit many parents who did not work or who had flexible work hours. However, I was mostly unsuccessful. Perhaps since being present in the classroom was not part of the established norm for upper grade parents, many who might have participated felt uncomfortable doing so.

Another issue for some parents may have been lack of confidence. One parent, whose daughter was in my math class, did not work out of the home and seemed intrigued by my study. I spoke with her at the beginning of the school year and she expressed her discomfort with math. I tried to suggest that coming into class might be interesting for her (and I reached out to her before each visit), but she never came. My sample size was not as large as I had hoped for the reasons above (and probably others of which I am unaware).

**Core Group.** Since my research questions are based upon changes parents experienced over time, only those who attended at least three classroom visits were considered full participants. The following chart gives background information about the six parents who made up this core group. The first column gives each parent’s pseudonym; the second tells whether or not his/her child was in my math class. The chart also shows how many classroom visits each parent attended. Finally, each parent’s reason for participating has been included; I gathered this information during parent interviews.
Table 1

Background Information for Core Group of Parents

<table>
<thead>
<tr>
<th>Name</th>
<th>Child in my class?</th>
<th>Number of visits</th>
<th>Reason for participating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Altman</td>
<td>No</td>
<td>3</td>
<td>To assist me</td>
</tr>
<tr>
<td>Ms. Cutler</td>
<td>No</td>
<td>4</td>
<td>To learn about EM</td>
</tr>
<tr>
<td>Ms. Heather</td>
<td>Yes</td>
<td>9</td>
<td>To assist me</td>
</tr>
</tbody>
</table>

Data Collection

In their discussion of data collection for qualitative research, Anderson, Herr, and Nihlen (1994) claim that:

Combining the techniques in different ways, called triangulation of data, allows the researcher to maximize time and to see the same scene from different angles. For practitioner researchers, this can provide a very important perspective. It helps the researcher separate from a classroom or school that he or she knows intimately. (p. 115)

For this study, I followed the principle of data triangulation by collecting data in various ways as described below. In addition, a feature unique to this study was the attempt to capture change as a result of the intervention.

**Parent questionnaires (October, 2009)**

I asked parents to complete a survey before becoming involved in classroom visits (see Appendix A). Questions focused upon three areas. First, parents were asked to identify actions they took at home when helping their children with mathematics. They were asked to choose “never,” “sometimes,” “usually,” or “always” to quantify how often they completed an activity. For instance, “Study for a test with your child” was one of the statements. Second, the questionnaire contained belief statements about mathematics
teaching and learning, such as "Children learn math best by working with their peers."

Parents chose either "strongly agree," "agree," "disagree," "strongly disagree," or "I have no opinion" for each belief. Finally, I asked questions aimed at determining parents' understanding of and feelings about *Everyday Mathematics*. For example, I asked parents to decide whether they knew "a lot," "a moderate amount," or "very little" about the curriculum.

This questionnaire was sent home with each 2009-2010 fourth grader at Monroe. Parents were encouraged to fill it out regardless of whether or not they were able to participate in the study. I present the data in Chapter 4; they provide background information for the study's population and serve to increase my understanding of how Monroe parents viewed *Everyday Mathematics* and mathematics teaching and learning.

Each time a parent came to his/her first visit, I checked to be sure that he/she had filled out a questionnaire. I used the information provided as a baseline for parents' views and referred to the questionnaires when interviewing parents throughout the study.

**Parent recruitment (October, 2009 through June, 2010).**

At the end of September, during Back to School Night, I presented my study to the fourth graders' parents in attendance. I stressed my belief that participating would be beneficial for parents in many ways. I highlighted the idea that coming into math class might make the curriculum more accessible. Shortly after that night, I sent home the initial parent questionnaire to each fourth grade family. Attached was a letter from Monroe's principal encouraging parents to be a part of my study.
I created a contact list of parents’ email addresses and used this list heavily throughout my study. At the beginning of each month, starting in November, I sent parents a quick email giving them the two visit dates for the month. Then, a few days before each visit, I sent an additional email giving parents information about the lesson we would be doing during the visit and suggesting ways in which they might participate while in the classroom. For parents without email, I often wrote notes in their child’s assignment book. I continually made it clear that parents could visit as many or as few times as possible and that they could join the study at any point.

Parents’ visit journals (November, 2009 to June, 2010)

Each time a parent came to a classroom visit, he/she was asked to fill out a visit journal (Appendix B). This was designed to help me understand what parents thought about the lessons they observed and what they focused on while in the classroom. Perhaps most importantly, these journals provided me with timely information. As the classroom teacher, I was unable to interview parents directly after each visit. Instead, I called parents at home in the evening and it was not unusual for a few days to go by before I reached each parent. The journals were immensely helpful as a basis for interview questions and conversations.

Parent interviews (November, 2009 to June, 2010)

After each parent visit, I conducted a phone interview with each attendee. Before each call, I reviewed parent visit journals and questionnaires. Both of these documents proved to be greatly helpful when it came to completing interviews. For instance, one parent often wrote on her visit journal about her belief that each student should be called
on during every class, regardless of whether or not hands were raised. This led to interesting discussions during our interviews. In addition, referring to questionnaires assisted me in my quest to determine if parents' beliefs were changing. For example, one parent did not agree with the use of manipulatives on his questionnaire. However, after viewing a lesson during which we used base ten blocks, we talked about them and he agreed that they were very useful.

My goal was to keep these interviews as short as possible. I did not want parents to feel burdened by my phone calls. I also attempted to adopt a conversational approach as this is the way I have always found to relate well to parents. Overall, parent interviews went quite well. Parents seemed happy to talk to me and the data I collected during these calls was invaluable.

Data Analysis

Analysis during the Study (October, 2009 through June, 2010)

According to Merriam (1998), “the right way to analyze data in a qualitative study is to do it simultaneously with data collection” (p. 162, italics in original). For this study, analysis began as soon as data collection began. Once I received the parent questionnaires, I read them and entered the responses into an excel spreadsheet in order to look for patterns. This was important in that it gave me an overall sense of what the parents thought of Everyday Mathematics, what they believed about math instruction and the types of activities they completed at home with their children.

Parent visit journals were filled out by parents during their visits and represented snapshots of their experiences in the classroom. After each visit, I read the journals I
received for that day. This helped me find patterns related to the lesson or mathematics topic. For instance, during one lesson, calculators were used. Some parents thought it was great, while others did not think they were necessary. Finding these discrepancies was enlightening and I often used them to start discussions during parent interviews. As time went on, it was also useful to look at parent journals across time. I used them to determine whether or not parents’ beliefs were changing as they visited the classroom.

During each parent interview, I took notes regarding any information I deemed important. This way, I could refer back to my notes during later conversations. This was important since I had little time to look over transcribed interviews while conducting the study.

At the end of the 2009-2010 school year, I identified the six parents who attended three or more classroom visits. I sent each of these parents a second, shorter questionnaire (see Appendix C). The questions were identical to questions on the initial questionnaire. However, they focused upon only two areas, parents’ beliefs about math instruction and the ways they worked with their children at home. These questionnaires were designed to help me determine whether or not parents’ beliefs and actions had changed. I then sent copies of both the initial questionnaire and this newer one to parents to refer to during an exit interview that would be conducted over the phone.

Analysis after the Study (beginning in June, 2010)

Qualitative data. As soon as the school year ended, I was able to focus solely on data analysis. I began by completing an exit interview over the phone with each parent who attended three or more classroom visits. I used the two parent questionnaires as
focal points. My main goal was to determine what changes parents experienced as a result of participating in my study. To this end, I asked parents questions such as: What do you think you learned as a result of visiting the classroom? Would you say you like the curriculum more or less based on what you observed? Do you feel you know more about the curriculum now? I also compared the two questionnaires to find discrepancies between them. I asked about each of these discrepancies in order to uncover any changes in parents’ beliefs and actions.

For each parent who visited at least three times, I created a folder with all of his/her visit journals and transcribed interviews. My next step was to read through the journals and interviews. Using my research questions as a guide, I coded this data for four things: understanding, focus, beliefs, and at-home actions. It quickly became obvious that, within these categories, there were going to be subcategories.

Data that were coded for understanding represented parent learning as a direct result of classroom visits. During my initial read through, I identified two categories of understanding. As a result of viewing lessons in the classroom, parents learned about the Everyday Mathematics curriculum. For instance, one parent said during an interview, “I’m so glad I could participate. I really could see the reasoning behind the Everyday Math, which I didn’t understand before today.” (Ms. Hebron, Parent journal, 1/14).

Some parents also learned about mathematical content as a result of being present in the classroom. This is the second subcategory for which I coded. One parent stated, “You

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3 Throughout the dissertation, this is how quotes from parents will be cited. In parentheses I will include the parent’s pseudonym, the source, the date and the page number (if needed).
brought back things that I have not done in a long time...like the decimals. I totally forgot all that stuff.” (Ms. Rothman, Parent interview, 11/10, p. 1)

Data that were coded for focus incorporates what parents focused upon, or what stood out for them during classroom visits. Within this category, I identified three subcategories: students, curriculum, and teaching. Parents took notes and made comments about students with regard to what happened during lessons. They also focused on elements of the curriculum. For example, many Everyday Mathematics lessons incorporate a short slate drill during which students answer quick math questions by using individual chalk boards. Parents often commented on these slate drills. A third element of focus for parents was the teaching. One parent noticed that I often asked students to explain how they got their answer.

Information I collected from parents regarding their beliefs fell into two categories. Parents expressed their beliefs about math teaching and learning. For example, one parent noticed that my classroom had a math word wall. She liked this and said, “I am a firm believer that math is a language and if you teach the vocabulary, it is just that much easier.” (Ms. Altman, Parent interview, 5/10, p. 5). Parents also articulated their beliefs about the Everyday Mathematics curriculum. For instance, one parent commented that the curriculum “teaches critical thinking which is great for life, but some things I think you have to just memorize.” (Ms. Hebron, Parent interview, 1/14, p. 6)

The final category for which I coded was actions parents took with their kids at home. This category did not need to be subdivided. The data included ways families
dealt with school work and also ways in which parents used math with their children in less structured ways.

My next step was to use the categories detailed above to determine ways in which the intervention study impacted parents. What changes did parents experience as a result of their participation? Based on my data, I made assertions and determined which parents fit with each assertion. For instance, parents changed the way they work with their children at home as a direct result of participating in the study. One mother often had trouble helping her son with math homework. After one of her visits, she said, “I actually looked forward to the homework ...I was actually able to help him...I felt really confident about it” (Ms. Brown, Parent interview, 2/9, p. 8). These findings will be discussed in detail in Chapter 5.

Quantitative data. Although this study was qualitative in nature, the initial parent questionnaire provided quantitative data. I utilized PASW Statistics, version 18 (formerly called SPSS) in order to help me with the analysis. For many of the items on my questionnaire, I used Likert scales. For the purpose of analyzing the data, I assigned each response to a number. For instance, I assigned the number one to a response of “never,” a number two for “sometimes,” the number three represented “usually,” and four corresponded to “always.” I used the software to calculate the means and standard deviations for each Likert item.

The quantitative data assisted me in my quest to understand Monroe parents’ beliefs about mathematics education and about Everyday Mathematics prior to the intervention. For example, 35 out of 37 parents either agreed or strongly agreed with the
following statement: “I like the way math is presented by the *Everyday Math*
curriculum.” This finding suggested that parents who might subsequently participate in
my study viewed the curriculum in a positive light. In addition, the data I obtained from
questionnaires were also used to frame interview questions and guide discussions with
parents.

**Limitations**

There were a few limitations that most likely affected the outcome of this study.
Firstly, the research process was relatively new to me. According to Merriam (1998)
qualitative researchers are “limited by being human – that is, mistakes are made,
opportunities are missed, personal biases interfere” (p. 20). Certainly new researchers are
at a greater risk of encountering the sorts of issues to which Merriam refers.

Being aware of one’s biases is not as difficult as putting them aside. My bias
toward standards-based mathematics programs is evident. I am aware that I designed this
study assuming that, once parents learned more about what goes on in the classroom, they
would appreciate *Everyday Mathematics*. Being aware of this issue, I tried to keep my
opinions about the program to myself during parent interviews and I made it clear to
parents that I wanted them to be honest. However, when using the curriculum and
materials in my classroom, I am enthusiastic as I believe this rubs off on students.
Parents witnessed my excitement when they came in for classroom visits. This was
unavoidable. Thus, I wonder if some parents held back any negative commentary during
our discussions.
A second limitation that probably affected my study was the fact that I was acting as both the teacher and the researcher. According to Cochran-Smith and Lytle (1993), when it comes to practitioner research “the complex and extensive demands on teachers’ time and attention place obvious limitations on what teachers can manage to do” (p. 18). As a classroom teacher, I found that we were given more responsibility each year. Whether there was a new curriculum to learn or more pressure regarding state mandated test scores, teachers’ workloads were constantly increasing. Conducting this intervention study in my classroom was difficult. Looking back, the hardest part of taking on both roles was not being able to speak to parents directly after visits. In some cases, a few days went by before formal interviews took place. As a result, my data might not be as rich as they could be. Luckily, the parent visit journals allowed me to collect some data immediately.

Another limitation of my study was a flaw in my design. Before each visit, I put a desk at the door to my classroom where parents could pick up materials and sign in. One of the materials I always left for parents was the visit journal. I realized quickly that parents were filling out their journals as I was teaching the mini-lesson and they may have missed some important moments. I probably should have given out those papers during the last 10 or 15 minutes of class.
Chapter 4: Quantitative Data

A parent questionnaire was sent home with each 2009-2010 fourth grader at Monroe. One of my main objectives was to get an overall sense of Monroe parents’ beliefs about mathematics education and Everyday Mathematics. I also hoped to gain an understanding of the ways in which parents worked with their children at home. After a brief description of the survey and discussion of sampling issues, I present the findings for the entire population that completed the survey and then for the core group of parents in the study.

Survey Overview

The parent questionnaire (see Appendix A) that was sent home before the intervention began had three sections. The first group of questions was included to gather information regarding how often parents took specific actions at home while helping their children with mathematics. The next section asked participants about math at Monroe. For instance, parents indicated how much they knew about and whether or not they liked Everyday Mathematics. The final set of questions asked parents to either agree or disagree with belief statements about mathematics teaching and learning. The core group of parents completed a second questionnaire after the intervention (see Appendix C). This questionnaire contained the same questions from both the first and third sections of the initial questionnaire. Asking parents these questions again assisted me in identifying changes to the actions they took at home and to their beliefs.
Population and Sampling Issues

Each Monroe fourth grader (n=100) was given a parent questionnaire to take home. I attempted to elicit support and participation by mentioning the questionnaires at Back to School Night. I also sent an email alerting all parents of fourth graders to look for the questionnaire in their child’s homework folder. Forty-one parents completed and returned their questionnaires by sending them into school with their children.

One potential limitation of my questionnaire data was that filling it out was voluntary and no incentives were offered for completion. Thus, responses may have been biased depending on who chose to complete the questionnaire. Respondents may have been the parents who were most involved in their children’s learning and/or most interested in education. Or, perhaps this sample of parents was comprised of those who had made efforts to learn about the curriculum. My findings show that most parents liked the curriculum. However, this may have been true for respondents because they found ways to learn about it or were interested in math education. Those who did not complete the questionnaire may have had quite different opinions.

Another issue was that, although these questionnaires were confidential, they were not anonymous. This may have deterred those with negative feelings from completing them. It is possible that only the parents with encouraging things to say about Everyday Mathematics and their children’s math education were willing to share their opinions with me. It is important to remember that, although I was collecting data as a researcher, I was also a teacher in their children’s school. As will be discussed below,
however, there was large variation in responses on the parent questionnaire. This caused me to believe that any bias present in my sample was minimal.

Although I was pleasantly surprised with the number of questionnaires that were returned to me, there were still approximately 60 families whose voices were not accounted for in this data. I cannot assume that these missing surveys would be similar to those I received. Any assertions I make below are based upon the data I was able to collect.

Survey Findings for the Total Population

Parents’ Beliefs

The parent questionnaire (see Appendix A) contained a chart with eight statements featuring beliefs about math teaching and learning. Parents responded by checking either “strongly agree,” “agree,” “disagree,” “strongly disagree” or “I have no opinion” for each statement. This section of the questionnaire was designed to help me understand Monroe parents’ beliefs about mathematics teaching and learning. For the most part, the parents who completed the survey held beliefs that aligned with standards-based mathematics. For the purpose of quantitative data analysis, I assigned values to each descriptor with “strongly disagree” = 1, “disagree” = 2, “agree” = 3 and “strongly agree” = 4. After entering the questionnaire data, I used the data software to calculate the means and standard deviations for each belief statement. The following chart lists the beliefs in order from highest to lowest mean (from most to least agreement).
Table 2
Means and Standard Deviations for Belief Statements

<table>
<thead>
<tr>
<th>Action</th>
<th>N</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children learn math best through repetition</td>
<td>40</td>
<td>3.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Most math problems fourth graders are given should use real world contexts</td>
<td>34</td>
<td>3.21</td>
<td>0.59</td>
</tr>
<tr>
<td>Children learn math best by working with their peers</td>
<td>32</td>
<td>3.03</td>
<td>0.60</td>
</tr>
<tr>
<td>It is more important for students to have the multiplication facts memorized than be able to solve problems</td>
<td>37</td>
<td>2.24</td>
<td>0.80</td>
</tr>
<tr>
<td>Note. Range of responses was between 1 and 4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first statement was, “Children learn math best by working with their peers.”

A small majority of Monroe parents (55%) agreed with this statement (mean = 3.03; SD = .60). As discussed in Chapter 1, an important element of standards-based curricula is that students work together on mathematical tasks. Along these same lines, parents were asked to respond to this statement: “Discussion amongst students in the math classroom impedes learning.” Almost 60% of parents either disagreed or strongly disagreed (mean = 2.39; SD = 1.02). Based on these results, I conclude that the majority of parents who
filled out the questionnaires felt that it was important for students to work collaboratively in math class.

Four of the statements on the questionnaire were about the nature of math tasks. A large majority of the parents (92%) who completed the questionnaire either agreed or strongly agreed that, “It is important for students to learn more than one way to solve math problems” (mean = 3.51; SD = .78). Many of the parents (75%) also agreed that math problems for fourth graders should be set in real world contexts (mean = 3.21; SD = .59). When given a statement about working with manipulatives, 65% of those who responded endorsed their use (mean = 3.06; SD = .72). Finally, about two-thirds of the parents disagreed or strongly disagreed that, “It is more important for students to have the multiplication facts memorized than be able to solve problems” (mean = 2.24; SD = .80). Overall, these results suggest that survey respondents understood that solving problems is an important goal when it comes to learning mathematics. They also felt that most of the problems students are given should focus on real world situations and students should be given hands-on tools to solve problems in various ways. As discussed in Chapter 1, these are all tenets of Everyday Mathematics, a standards-based mathematics curriculum.

One statement on the questionnaire was specific to Everyday Mathematics (“The language and symbols of Everyday Math are difficult to understand”). In my experience, this is an area in which parents struggle when trying to help their children with school math. For instance, Everyday Mathematics utilizes an asterisk for multiplication rather than an “x.” An example of language that I found to confuse parents is the use of the phrase “trade first” rather than “borrow” when it comes to adding large numbers.
Surprisingly, I found that 65% of the parents who responded did not feel that the language and symbols were confusing (mean = 2.12; SD = .70). Interestingly, an additional 15% had no opinion. If fourth grade Monroe parents had difficulty helping their children with math, for most of them the different symbols and language that the curriculum uses were not the main issue.

Only one statement on the questionnaire suggested that parents held traditional views of math teaching. It read, “Children learn math best through repetition.” In fact, 95% of respondents either agreed or strongly agreed with this statement (mean = 3.55; SD = .55). Repetition of mathematical exercises is commonly associated with procedure-focused curricula and not constructivist approaches. As will be discussed in the following chapter, many of the parents who participated felt that *Everyday Mathematics* was lacking in this area. They did not change their belief in the importance of repetition after participating in the study.

**Views on *Everyday Mathematics***

This research was designed to discover the changes that parents experienced as a result of visiting my mathematics classroom. One change I anticipated was that parents would learn more about the curriculum, *Everyday Mathematics*. And, as this occurred, I wondered if parents would learn to appreciate it more (or less) than before the study. The parent questionnaire contained a few items to help me establish parents’ feelings toward *Everyday Mathematics* before coming to visit the classroom. For the first two statements in Table 3, I used the same descriptors and assigned values as above (from strongly disagree to strongly agree). For the third statement, respondents chose amongst “very
little,” “a moderate amount” or “a lot.” I assigned the value of 1 to “very little,” 2 to “a moderate amount” and 3 to “a lot.” The following table presents the means and standard deviations for these items.

Table 3

<table>
<thead>
<tr>
<th>Action</th>
<th>N</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The way math is taught at Monroe is different than the way I learned math in elementary school</td>
<td>41</td>
<td>3.63</td>
<td>0.54</td>
</tr>
<tr>
<td>How much do you feel you know about the Everyday Mathematics curriculum used at Monroe?</td>
<td>41</td>
<td>1.93</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Based upon my experience and the research cited in this paper, I speculated that the majority of Monroe parents learned math through mostly procedure-focused curricula and teaching methods. This is somewhat different from the constructivist approach of Everyday Mathematics. Thus, I included this statement on the questionnaire: “The way math is taught at Monroe is different than the way I learned math in elementary school.” Parents were asked whether they strongly agreed, agreed, disagreed or strongly disagreed with this statement. Thirty-nine out of 40 parents (98%) chose either strongly agree or agree, confirming my hypothesis that a large majority of the parents believed that they were taught math differently than their children were being taught (mean = 3.63; SD = .54).
Parents were also asked, “How much do you feel you know about the *Everyday Mathematics* curriculum used at Monroe?” Thirty-three out of 40 parents (83%) who answered this question circled either “a moderate amount” or “a lot” (mean = 1.93; SD = .52). They documented various ways in which they came across this information. For example, parents kept a copy of the *Everyday Mathematics* Student Reference Book at home and many identified this as a source of information. Some also stated that their children taught them about the curriculum and that they learned at district organized math nights for parents (these were held once per year).

There were seven parents in the sample who claimed to know “very little” about *Everyday Mathematics*. Two of these parents came to visit the classroom once; both were mothers who had young children at home and did not have child care during the visits. They each expressed to me that they benefited from their visit and wished they could participate more. One of them said, “It was very informative, and I really enjoyed it. And watching the way it is presented to the kids makes it easier for me” (Ms. Montgomery, Parent interview, 12/2, p. 2).

Based upon these two mothers who were able to come to the classroom for one lesson, I speculate that participating in the study may have benefited the parents who knew “very little” about the curriculum. Unfortunately, I do not have such data since these parents did not visit the classroom. I also cannot be sure why the other five parents who reported having little knowledge of *Everyday Mathematics* did not participate at all. I wonder if the fact that they knew very little about the curriculum intimidated them.
However, it is also possible that they knew so little because they lacked sufficient time to take advantage of opportunities (such as this study) to learn more.

Parents who completed the questionnaire also responded to eight statements about math education. Using the PASW software, I carried out a Spearman correlation involving all quantitative data from the questionnaire. Parents’ reported level of knowledge regarding *Everyday Mathematics* was negatively correlated (at the \( p < .05 \) level of significance) with two of the beliefs about teaching and learning on the parent questionnaire: “Children learn math best through repetition” (\( r = -.410; p = .009 \)) and “Discussion amongst students in the math classroom impedes learning” (\( r = -.383; p = .021 \)). Therefore, the more parents felt they knew about the curriculum, the less likely they were to agree with the use of repetition in math class and the more likely they were to support peer discussion. As discussed in Chapter 1, when it comes to standards-based curricula, repetition is not often utilized and cooperative peer work is essential. Therefore, it makes sense that parents who were knowledgeable when it came to *Everyday Mathematics* would support peer discussion and not repetition.

The majority of Monroe parents who completed the questionnaire believed that they learned math differently than how their children are learning it. However, they claimed to know a bit about the curriculum as well. Although this type of curriculum was something new for most of the parents, I wanted to find out how they felt about it. Thus, the parent questionnaire contained the following statement: “I like the way math is presented by the *Everyday Math* curriculum.” Thirty-five out of 37 parents (95%) circled either “agree” or “strongly agree” (mean = 3.09; SD = .61). This group of parents felt
that they knew at least "a moderate amount" about *Everyday Mathematics* and they liked it.

The parent questionnaire also contained a section focused upon what parents do to assist their children in mathematics at home. Each of the nine statements represented an action parents may take. Parents chose among the descriptors "always," "usually," "sometimes" or "never" for each action (see the following section for a chart of means and standard deviations). Upon analyzing the data, I discovered a negative correlation between the degree to which parents reported to like the curriculum and the belief statement, "It is more important for students to have the multiplication facts memorized than be able to solve problems" ($r = -.387; p = .021$). Parents who appreciated the constructivist approach of *Everyday Mathematics* did not feel that memorizing math facts was more important than learning to solve problems. As discussed in Chapter 1, the curriculum focuses on problem solving a great deal more than memorization.

Given the notion that many parents find it difficult to support their students learning in standards-based math classrooms (Remillard & Jackson, 2006), these findings are noteworthy. As a group, the parents who filled out the questionnaire believed that their children were learning math differently than how they learned it. However, many made efforts to get to know the *Everyday Mathematics* curriculum and they regarded the constructivist approach with positive attitudes.

**Parents' Actions at Home**

One section of the parent questionnaire focused upon parents' engagement with math at home. For each of nine action statements, parents were asked to select among
four descriptors. For the purpose of quantitative data analysis, I assigned values to each descriptor with “never” = 1, “sometimes” = 2, “usually” = 3 and “always” = 4. The results from these action statements allowed me to understand what parents did at home to help their kids with math. In the table below, the action statements are listed from most to least common.

Table 4
*Means and Standard Deviations for Action Statements*

<table>
<thead>
<tr>
<th>Action</th>
<th>N</th>
<th>Mean</th>
<th>Std. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check to see that homework is done and correct</td>
<td>41</td>
<td>3.66</td>
<td>0.48</td>
</tr>
<tr>
<td>Study for a test with your child</td>
<td>41</td>
<td>3.02</td>
<td>0.88</td>
</tr>
<tr>
<td>Contact the teacher when you have a question or concern</td>
<td>39</td>
<td>2.49</td>
<td>1.05</td>
</tr>
<tr>
<td>Introduce math activities related to school work</td>
<td>41</td>
<td>2.39</td>
<td>0.80</td>
</tr>
<tr>
<td>Change the homework in some way</td>
<td>41</td>
<td>2.12</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Note. Range of responses was between 1 and 4.

The majority of parents reported that they “usually” or “always” did the following three things: “Study for a test with your child” (mean = 3.02; SD = .88), “Encourage your child to check his/her work” (mean = 3.54; SD = .67) and “Check to see that homework is done and correct” (mean = 3.66; SD = .48). There is quite a bit of variation for the first two statements. (See Appendix D for histograms depicting the distribution of data.)
There are four statements for which the majority answered “never” or “sometimes.” They are, “Change the homework in some way” (mean = 2.12; SD = .81), “Encourage your child to solve the homework problems in a different way” (mean = 2.27; SD = .78), “Introduce math activities not related to school work” (mean = 2.49; SD = .84) and “Introduce math activities related to school work” (mean = 2.39; SD = .80). There is also quite a bit of variation for each of these statements. The histograms show that about half of the respondents answered “sometimes” for each of these four statements (see Appendix D for corresponding histograms).

Parents’ Roles: Direct or Indirect?

I used Jinfa Cai’s (2003) work will to categorize parents’ actions and identify the roles they assumed when helping their children with mathematics. Cai’s subjects in the United States (his study also took place in China) consisted of 232 middle school students. Parents completed a parent involvement questionnaire aimed at determining the level and types of involvement they engaged in when assisting their children with mathematics. Student performance was measured using an assessment that contained both multiple choice and open-ended items with a focus on mathematical problem solving.

Cai (2003) identified five roles that parents typically assume while helping their children with mathematics. These are motivator, resource provider, monitor, mathematics content advisor, and mathematics learning counselor. Cai argued that “parental involvement is positively related to student mathematics learning” (p. 89) based
upon his finding that “students with the most supportive parents demonstrated significantly higher performance” (p. 98) on both types of assessment items.

I assigned each of my questionnaire action statements to one of Cai’s parent roles (see Table 5 below).

Table 5

<table>
<thead>
<tr>
<th>Action</th>
<th>Parent role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the homework in some way</td>
<td>Monitor</td>
</tr>
<tr>
<td>Ask your child to explain how he/she solved a problem</td>
<td>Monitor</td>
</tr>
<tr>
<td>Check to see that homework is done and correct</td>
<td>Content advisor</td>
</tr>
<tr>
<td>Introduce math activities not related to school work</td>
<td>Resource provider</td>
</tr>
<tr>
<td>Encourage your child to check his/her work</td>
<td>Motivator</td>
</tr>
</tbody>
</table>

Cai (2003) found that “The direct assistance roles of parents as content advisors and learning counselors are less important predictors” (p. 89) of student success when compared to the other three roles. The statements on the parent questionnaire that depict these two roles are: “Study for a test with your child,” “Check to see that homework is done and correct,” and “Contact the teacher when you have a question or concern.” The means for each of these respectively are 3.02, 3.66, and 2.49. Thus, for the first two statements in this group, the majority of parents chose “usually” or “always” to indicate how often they employed such actions at home. For the last statement, most parents chose “sometimes” or “usually.” Therefore, my data suggest that parents at Monroe tended to offer direct types of assistance to their children.

Cai (2003) envisioned the roles of motivator, resource provider and monitor as being mostly based on emotional support. He argued that these indirect types of support
are more beneficial for both students' performance and students' attitudes toward mathematics. The remaining six action statements on the parent questionnaire fit with these three roles. Interestingly, most of these statements have a mean that is lower than those above, indicating that they were less common in Monroe households. For instance, for “Encourage your child to solve the homework problems in a different way” the mean is 2.27 and the mean is 2.12 for the action, “Change the homework in some way.” So, the majority of Monroe parents answered “sometimes” for these statements.

Based on this exploratory analysis, I conclude that Monroe parents were more likely to provide direct assistance when it came to assisting their children with math. Cai’s (2003) findings were somewhat similar. Parents reported being supportive in many different ways, but were most comfortable with the role of content advisor, a role Cai considered to be direct. In Cai’s study, the direct roles of content advisor and learning counselor did not increase student success with the problem solving assessment. The other three, indirect roles did. For the purposes of my study, I speculated that participating in the intervention would change the way parents worked with their children at home. Perhaps the roles they assumed would change as well, moving from direct to indirect. This will be discussed further in Chapters 5 and 6.

**Survey Findings for the Core Group**

Given that my research questions are based upon changes parents experienced over time, it was important for me to determine what constituted full participation in the study. To this end, only parents who completed three or more visits were considered full participants. The six parents who met these requirements make up the core group. In the
following section, I compare their questionnaire results with those of the larger sample. My aim is to not only locate the core group within the larger group, but also begin to introduce the reader to the core group. Based upon the survey data, there were no specific areas for which obvious differences appeared between the core group and the larger group. This suggests that the core group was fairly representative of the larger sample.

Parents' Beliefs

For the first belief statement, "Children learn math best by working with their peers," the core group responded similarly when compared to the larger group. Three parents agreed with this statement, one disagreed and the others either had no opinion or did not complete the item. Therefore, a small majority of the core group supported working with peers in math class. The other statement involving peers ("Discussion amongst students in the math classroom impedes learning") elicited too wide a range of responses to draw any conclusions. Interestingly, three of the six parents in the core group did not complete this item. Perhaps since parents were not often present in the classroom, they were unsure. As will be discussed in the following chapter, several parents in the core group came to understand the importance of peer discussion as a result of participating in the study.

Four of the belief statements were about the nature of mathematical tasks. Each parent in the core group agreed or strongly agreed that "It is important for students to learn more than one way to solve math problems." Four out of six also agreed or strongly agreed that math tasks should be set in real world contexts in fourth grade. The same
number of respondents disagreed or strongly disagreed that “It is more important for students to have the multiplication facts memorized than be able to solve problems” (the other two parents did not have an opinion regarding this statement). These results are consistent with those of the larger group. The fourth statement was, “Fourth graders should work frequently with math materials.” Within the core group, there was too much variation of responses to draw a conclusion. Based upon these results, the parents in the core group generally supported the standards-based approach to problem solving.

The large sample held one view that aligned with traditional views of mathematics. The majority of these parents agreed that “Children learn math best through repetition.” Similarly, each parent in the core group either agreed or strongly agreed with this statement. As will be discussed, repeated practice of math exercises is something that Monroe parents felt was missing from the curriculum (and those that participated did not change their belief about this).

Overall, the core group’s beliefs about math teaching and learning aligned well with standards-based mathematics. However, one core parent (Mr. Goodman) seemed to have held a more traditional view before participating in the study. For instance, he agreed that “Discussion amongst students in the math classroom impedes learning” and disagreed with the statement “Children learn math best by working with their peers.” He also disagreed with the use of real world context and with the use of manipulatives. By the end of the study, Mr. Goodman changed his mind about each of these beliefs (this will be discussed in the next chapter).
The parent questionnaire was designed to gauge parents’ feelings toward the way their children were learning math at school. In response to the statement, “The way math is taught at Monroe is different than the way I learned math in elementary school,” each of the parents in the core group either agreed or strongly agreed. In response to the question, “How much do you feel you know about the *Everyday Mathematics* curriculum used at Monroe?” all six parents in the core group answered “a moderate amount.” Every parent in the core group also agreed or strongly agreed that they liked the *Everyday Mathematics* curriculum. These results are similar to those found in the larger sample. Thus, before participating in the study, the core group felt that they knew a bit about the curriculum and they liked this constructivist approach to teaching mathematics.

**Parents’ Actions**

When it comes to things parents do at home to help their children with mathematics, the core group’s responses were generally similar to those of the whole sample. There were three actions that a majority of the whole sample reported doing on a regular basis. For two of these (“Check to see that homework is done and correct” and “Encourage your child to check his/her work”), every parent in the core group answered “usually” or “always.” For the other (“Study for a test with your child”), four out of six core parents responded “usually” or “always.” Thus, the actions I found to be typical in Monroe households were similar between the two groups.
There were four statements for which the majority of the large sample answered "never" or "sometimes." For three of these statements, either four or five parents in the core group responded similarly. For the other action ("Introduce math activities not related to school work"), half of the core parents answered "never" or "sometimes." Again, these results mirror those of the large sample. Thus, the core parents also seemed to take on roles that Cai (2003) would categorize as direct. Would participating in the study cause parents to change their actions and/or roles at home? This will be discussed further in Chapters 5 and 6.

The six members of the core group of participants responded to the parent questionnaire similarly when compared to the large sample. They held many beliefs that align with standards-based mathematics, appreciated the constructivist nature of the Everyday Mathematics curriculum, and participated with their children at home in various ways. These six parents visited my classroom various times throughout the intervention, providing me with rich, illustrative qualitative data. In the following chapter, I introduce the data and analyze them in order to uncover the changes parents experienced.
Chapter 5: Qualitative Data

Description of Parent Visits

From November 2009 through the school year, I invited all of the fourth grade parents to experience a math class twice monthly. The number of parents that came to each visit ranged from one to seven. The initial visits drew the most parents, seven at the first visit and six at the second. For every other visit, there were at least three parents (with the exception of one visit in the middle of a snowy week).

Before each planned classroom visit, I left parent visit journals and pens on a desk outside the classroom. I also left copies of any math book pages that we would be working on that day and tools parents may need (such as rulers or compasses) to fully experience the lesson. I did not tell parents where to sit or stand during the lesson as I wanted them to go wherever they felt most comfortable. The following descriptions about what happened during visits were drawn from my research notes.

As parents came in, I welcomed them and told them to make themselves comfortable. For most parents, this meant finding a seat at the kidney-shaped table at the back of my classroom. Most of the parents remained at this table throughout the teacher-directed portions of the lesson. However, when children were paired in groups, parents sat with them. In fact, their location in the room tended to mirror the students’. While students were at their desks, parents sat at the table. While students were working in pairs or small groups, parents got up and joined them.

Some parents at the back table followed along with the lesson and some filled out the math book pages as the students did. Others listened but did not do the activities.
Still others chatted quietly and/or filled out their parent visit journals. There was one parent, Mr. Goodman, who never sat at the table in the back of the room. Instead, he walked around the periphery of the students’ desks, observing them (and sometimes leaning in quietly to help them). Initially, Ms. Spiro sat at the back table. However, after seeing where Mr. Goodman stood, she got up and did the same, abandoning the back table for the duration of her visits. She watched students closely and assisted when she felt they needed it. She told me that this gave her more insight as to what students were doing, and it made her feel more a part of the class.

After the teacher-directed portion of lessons, students either worked on their own or with partners. When parents joined them, various things happened. Except for one parent (Ms. Brown), all of the parents in the core group took on the role of helper, assisting students with their work. Ms. Brown worked alongside her son, taking on more of a learner role. As will be discussed, she was not comfortable with math and participated in the study in order to become a better resource for her son. Once in a while, I would notice that a parent or two seemed to be observing students more than anything else. However, I wonder if this came after some assistance had been given. In other words, a parent may have assisted students and then remained with them for a few minutes before moving on to assist others.

The Core Group

This section familiarizes the reader with the core group of study participants. This is the group of parents who attended at least three visits and who also completed an exit interview. As a reminder regarding each parent’s reason for participating, included
below is Table 1 (from Chapter 3). A short introduction for each of the six parents in the core group follows.

Table 1

*Background Information for Core Group of Parents*

<table>
<thead>
<tr>
<th>Name</th>
<th>Child in my class?</th>
<th>Number of visits</th>
<th>Reason for participating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Altman</td>
<td>No</td>
<td>3</td>
<td>To assist me</td>
</tr>
<tr>
<td>Ms. Cutler</td>
<td>No</td>
<td>4</td>
<td>To learn about EM</td>
</tr>
<tr>
<td>Mr. Goodman</td>
<td>No</td>
<td>1</td>
<td>To assist me</td>
</tr>
<tr>
<td>Ms. Heather</td>
<td>Yes</td>
<td>9</td>
<td>To assist me</td>
</tr>
</tbody>
</table>

It is worth noting that four out of the six parents in the core group did not have children in my math class. Each of these four had a child in either my homeroom or my language arts class, except for Mr. Goodman. (Mr. Goodman’s older son was in my math class a few years prior.) When I inquired about his motivation for participating, he said that he was interested in helping me. He also expressed his desire to be a role model for his children. He stated that he “wanted to represent to [his sons] that when things like that happen, you want to help those people” (Mr. Goodman, Parent interview, 11/10, p. 2). Another intriguing fact about the core group of participants is that only two of them did not work outside the home during the study. I had assumed that working parents would not be available to participate. As it turned out, many of the parents who visited had flexible hours or worked part time from home. Two of the seven even had full time jobs outside of the home. One worked in close proximity to Monroe and the other came to class and went into work late (math class began at 9 o’clock).
Ms. Altman

Ms. Altman worked as a project director while participating in this study and claimed to use math often both at work and at home. As a youngster, she attended both public and Catholic schools. When asked about her math education, she remembered learning through repetition and focusing on algorithms. She enjoyed math as a student and seemed comfortable discussing mathematics during our interviews.

Based upon the information Ms. Altman provided on her initial parent questionnaire, her beliefs about mathematics teaching and learning were slightly aligned with standards-based math. She agreed that students should use manipulatives and be able to solve problems in more than one way. After her second visit, she commented on the curriculum, “I have some faith in the layering approach of Everyday Math. There almost seems to be an understanding that they may not fully get it the first time through but...they will have another chance to learn it” (Ms. Altman, Parent interview, 3/10, p. 5). On the other hand, on her initial questionnaire, Ms. Altman strongly agreed that students learn through repetition.

Ms. Altman has one son who was in my homeroom class, but not in my math class. She told me that she participated in my study to help me, not necessarily to benefit her. Ms. Altman attended three classroom visits and completed an exit interview. When I asked her what changes she experienced as a result of participating in the study, she said, “I think the main change in my mind is just a greater appreciation of the Everyday Math program” (Ms. Altman, Exit interview, p. 1). In addition, I will argue that some of Ms. Altman's beliefs about math teaching and learning changed.
Ms. Brown

Ms. Brown worked full time as a classroom aide in a public school during this study. Although she did help students with math at her job, she worked with younger grades and said that fourth grade math was much harder for her. Ms. Brown felt that she had never been a good math student and, as we got to know each other, we often discussed her lack of confidence with mathematical knowledge as an adult.

Ms. Brown’s beliefs about math teaching and learning were well aligned with standards-based techniques before the study. For instance, she agreed that students should work with their peers. She believed that working in a standards-based mathematics classroom caused her to be supportive of such curricula.

Ms. Brown’s son was in both my homeroom and my math class. When I asked her why she was participating in my study, she said she wanted to assist her son “so I understand better how to help him with his homework” (Ms. Brown, Parent interview, 11/10, p. 2). Ms. Brown changed the way she works with her son at home, making the homework process more enjoyable for both of them. After her second visit, she said, “When we did last night’s homework, there seemed to be much less of a strain because I...listened to what you were teaching” (Ms. Brown, Parent interview, 12/2, p. 2). Ms. Brown is also the only parent who learned quite a bit of math content as a result of her participation. Despite working full time, Ms. Brown came to the classroom four times and completed an exit interview.
Ms. Cutler

Ms. Cutler worked for herself and maintained that she used math quite often for her job. She felt very comfortable with math content, but not with the *Everyday Mathematics* curriculum. Having grown up in a different country, Ms. Cutler told me that the way she learned math was very different than the way her son was learning.

Based upon her answers on the initial parent questionnaire, I would argue that Ms. Cutler’s beliefs about mathematics teaching and learning were well aligned with standards-based methods. For instance, she believed it is effective for students to work with and discuss math with their peers. On the other hand, she strongly agreed that repetition is essential when it comes to learning math. This came up during a few of our interviews (and will be discussed further).

Ms. Cutler’s son was in my homeroom class, but not in my math class. During our first interview, I asked her why she decided to participate in the study. She said, “I want to learn how you teach the kids and what is expected of the kids so I can come back and teach [my son] to help him if he has questions about what he learned” (Ms. Cutler, Parent interview, 3/10, p. 1). She wanted to learn about the curriculum in order to help him. I will argue that she did just this, causing her to change the way she worked at home with her son. Ms. Cutler came to four classroom visits and completed an exit interview.
Mr. Goodman

During the study, Mr. Goodman worked full time as an engineer, using math often throughout the day. As a result, he was quite comfortable with mathematical content.

Based upon Mr. Goodman's answers on his initial questionnaire, his views of mathematics teaching and learning were mostly traditional. For instance, he agreed that students learn math best through repetition and disagreed with the use of manipulatives in the fourth grade classroom. Even though Mr. Goodman was the parent with the strongest math background, he was also the one who changed his beliefs the most. After his first visit, he changed his views on manipulatives. And, after his second visit, he began to understand the usefulness of real world context. He said, "I guess I would disagree with my prior statement. I would say that is a great value to the kids" (Mr. Goodman, Parent interview, 12/2, p. 3).

Although Mr. Goodman worked full time, he visited my math class ten times during the course of this study. His fourth grade son was not in any of my classes, although I did teach his older son two years prior. When I asked Mr. Goodman what motivated him to participate, he said, "I wanted to represent to [my sons] that when things like that happen you want to help those people. I want to help you get your doctorate and I want to help you help the kids" (Mr. Goodman, Parent interview, 11/10, p. 2). Although Mr. Goodman's motivation was not to learn anything, he learned about the curriculum and (as mentioned) changed many of his beliefs.
Ms. Heather

Ms. Heather did not work outside of the home during this study. She identified many ways in which she used mathematics throughout the day, such as balancing her checkbook and cooking. During our interviews, she was quite comfortable discussing math.

Based on her initial parent questionnaire, Ms. Heather’s views regarding math teaching and learning were somewhat aligned with standards-based mathematics. For example, she agreed that students should learn multiple ways to solve math problems and she endorsed the use of manipulatives. However, she also held some beliefs that were more consistent with a traditional view of math teaching. For instance, she agreed that students learn math best through repetition and she did not endorse discussion amongst students in the classroom. During our first parent interview, she said, “It is a good idea to have their friends to help them but I also think it is bad at the same time. When the peers are working with each other, it depends on what they are working on. I think they should rely on their own brain before going to someone else” (Ms. Heather, Parent interview, 11/10, p. 5). As I got to know Ms. Heather, it became obvious that many of her ideas about math teaching and learning were based on her own educational experiences, and she was somewhat reluctant to change her views.

Ms. Heather’s fourth grade daughter was in my homeroom and my math class. She attended classroom visits nine times and completed an exit interview. When I asked her why she decided to participate she said, “I did it for you. You asked for help and I
am willing to help” (Ms. Heather, Parent interview, 11/10, p. 1). She did not intend to learn anything, but I will demonstrate that she learned about the curriculum and changed the way she works at home with her daughter. As will be discussed, her feelings about the curriculum are still quite mixed.

**Ms. Spiro**

Ms. Spiro did not work outside the home during this study. However, before having children, she worked in the financial industry. Ms. Spiro also identified ways in which she used math in her daily activities, such as managing her checking account. Due to these life experiences, she felt quite comfortable with mathematics.

Ms. Spiro’s beliefs about math teaching and learning were well aligned with standards-based mathematics before participating in the study. For example, she agreed that students learn math best through working with their peers and using manipulatives. During her exit interview, we talked about peer discussion in the math classroom. She said, “They worked so well and they enjoy learning something from the others that, if it was wrong, they will get it right eventually” (Ms. Spiro, Exit interview, p. 10). Ms. Spiro was generally enthusiastic about *Everyday Mathematics* and considered it to be “easier than how we learned it” (Ms. Spiro, Parent questionnaire).

Ms. Spiro’s daughter was in my homeroom, but not in my math class. She attended three classroom visits and completed an exit interview. I will prove that, due to her participation in this study, she learned a good deal about the curriculum and gained a deeper sense of appreciation for it. She also changed the way she works with her daughter at home.
Parents’ Foci

One of my research questions was, "What do parents focus upon during their visits to the classroom?" I was also interested in what determined each parent’s focus and how this related to the changes they experienced. In this section, I elaborate on what I perceive to have been each parent’s main area of interest while in my classroom. Three parents in the core group focused upon students in the classroom (one focused mostly on her son) and the other three focused on teaching methods and tools.

Focused on the Students

Three of the core parents focused mostly upon the students in the classroom. Ms. Spiro and Mr. Goodman did not have children in the class. However, the majority of their comments revolved around the students in the room in various ways. Ms. Brown’s son was in my math class, and I believe she focused mostly on him and his experiences.

Ms. Spiro and Mr. Goodman often commented on students’ levels of engagement during math lessons. After one lesson, Ms. Spiro wrote in her journal that most students were engaged. When we discussed this further, she said, “There were one or two that were really just in their own world” (Ms. Spiro, Parent interview, 1/14, p. 5). She suggested that I could call on these students to involve them in the lesson. After a different lesson, she said, “The enthusiasm in the class was just wonderful” (Ms. Spiro, Parent interview, 6/8, p. 3). She noticed that there were a lot of students participating that day, and she felt that students were highly involved in the lesson. During the same lesson, Ms. Spiro was pleasantly surprised to note that “everybody did their homework”
Mr. Goodman also focused on student involvement and engagement during the lessons. After one visit, he wrote in his journal that student involvement changed depending upon the task. During our interview, he explained, “When you gave them a problem that required multiple steps, that required some period of time, something greater than a few seconds, then there was withdrawal and there was doubt” (Mr. Goodman, Parent interview, 3/10, p. 1). Mr. Goodman noticed that students were more willing to participate when the task was a quick one. Slate drills were a good example of such tasks. Regarding the slates, Mr. Goodman said, “The individual chalkboards are awesome. You can see what is going on in their brains and all of the students are actively involved” (Mr. Goodman, Parent journal, 12/2). Mr. Goodman often commented on whether or not activities in class kept the students focused and engaged. He liked the slate drills because it was an activity during which each student participated.

Mr. Goodman and I also spoke frequently about individual students and their experiences in the classroom. Mr. Goodman commented on how engaged one student, who often struggled, was during a lesson, “[He] kept going. He was energetic. He kept his interest and he kept trying” (Mr. Goodman, Parent interview, 2/24, p. 7). We often talked about this student and Mr. Goodman enjoyed working with him when he came to visits.

Mr. Goodman and Ms. Spiro also made comments regarding how students worked together during math lessons. For instance, Mr. Goodman often wondered if
students should be partnered according to their math aptitude. After working with two boys, he said, "They have such different abilities that maybe if we are more careful in how they pair up, that it would be more helpful to the kids" (Mr. Goodman, Parent interview, 11/10, p. 5). However, on the same day, Mr. Goodman noticed two girls sitting together, working at very different paces. Once he sat down with them, he realized that they worked well together, checking in often and helping find each other's mistakes. These examples depict Mr. Goodman taking note of how students work with their peers. I believe this led him to change his views on students working together; he became a strong proponent of it.

Ms. Spiro also wondered about the ways in which students did (or should) work together. For example, she expressed her opinion that the desks should have been arranged differently. She said, "I believe that the desks should be separated into rows. Looking at other people's answers turns into cheating so easily...Some kids really have no clue about the lesson and rely on looking over at their neighbor" (Ms. Spiro, Parent journal, 12/8). She agreed that students should be able to work together, but saw a need for the teacher to distinguish between this and cheating.

The above is an example of something Ms. Spiro often did. She commented on students' experiences and then made a suggestion related to what she observed. For instance, she felt that students should be called on even if they were not raising their hands. She said, "I would like to see every child called on during a lesson, even if their hand is not raised. Just because their hand is not raised doesn't mean they don't know the answer" (Ms. Spiro, Parent journal, 12/8). We discussed the fact that her daughter was
shy and often did not raise her hand. However, she was a good student and Ms. Spiro encouraged her teachers to call on her even if her hand was not raised. In my math class, she also thought that calling on students would be a good way to figure out who needed extra support with a particular skill. For Ms. Spiro, this was important because she believed that "working one-on-one is the ticket" (Ms. Spiro, Parent journal, 1/14). Ms. Spiro told me that, when her daughter needed a little extra help in math class, she asked the teacher to pull her aside and help her for a few minutes. Therefore, some of what Ms. Spiro focused on paralleled her concerns for her daughter. In addition, I believe that this focus on students helped Ms. Spiro understand what and how her daughter was learning in school. This prompted her to want to become more of a resource for her at home.

Just as Ms. Spiro’s ideas came from her experiences with her daughter, Mr. Goodman’s came from working with his two sons. He did not have experience with students who struggled as his children were both excellent math students. I believe he focused on students’ experiences because they were so different than his own and his sons’. Working with students of various levels caused Mr. Goodman to change many of his beliefs about math teaching and learning. It also helped him find more age appropriate ways to work with his sons at home.

Interestingly, Mr. Goodman and Ms. Spiro were the most active parents during classroom visits. They did not sit in the back of the room with the other parents. Instead, they walked around, helping students whenever it was appropriate. I believe this proximity to the students is another reason that they focused on students’ experiences.
While Ms. Spiro and Mr. Goodman focused on various students, Ms. Brown focused on her son. This aligns with her motive for participating in the study, to become a better resource for her son at home.

When I asked Ms. Brown what she noticed during her visits, she often made comments about what her son was doing. One day, she was wondering if her son was participating with his peers or copying what they had done. She said, “I was looking to see if [my son] was doing some of it” (Ms. Brown, Parent interview, 3/10, p. 3). She was happy to find that he was doing the work along with his friends. Later in the same interview, she said, “During the lesson, I would go up and kind of look over [my son’s] shoulder to see what he was writing... I noticed the other children were raising their hands and he was not raising his hand for anything” (Ms. Brown, Parent interview, 3/10, p. 3). On this occasion, she found that he was not raising his hand, but he had done the work correctly. Ms. Brown was curious about how her son participated in class and she often made comments about this.

During her first visit, Ms. Brown observed her son while he worked with his friend in class. She was concerned that they would not get their work done but found that “they were actually working together and [his friend] was helping him” (Ms. Brown, Parent interview, 11/10, p. 4). Ms. Brown had disagreed with the questionnaire statement that student discussion impedes learning, but was even more convinced when she saw the exchange between her son and his good friend in class.

After another classroom visit, Ms. Brown talked about her son’s involvement in the lesson: “He answered something in class and I was proud of him because he actually
participated... and he got the answer right, too” (Ms. Brown, Parent interview, 2/9, p. 6).

As a result of homework struggles, Ms. Brown was concerned that her son didn’t understand what was being taught in class. During this visit, she was pleasantly surprised to see that he not only understood, but also participated successfully in the lesson.

Ms. Brown’s focus during her visits was often on her son and what he was doing. Her motive for coming supports this; she wanted to feel better equipped to work with her son during homework time. Focusing on him and how she could help him caused her to learn math content along with him in the classroom and to become more of a resource for him.

**Focused on Teaching Methods and Tools**

The other three parents in the core group focused on the teaching methods and teaching tools that they observed while in the classroom. Ms. Altman, Ms. Cutler and Ms. Heather commented often on the various teaching methods they experienced in my classroom. I believe that these mothers focused on the teaching because they were either skeptical of it or pleasantly surprised by it.

Ms. Altman, Ms. Cutler and Ms. Heather made positive comments regarding the use of hands-on materials. For instance, Ms. Heather observed a lesson on volume. During one part of the lesson, students made paper boxes and filled them with centimeter cubes to find the volume of the box. Ms. Heather expressed her view that the students seemed to “enjoy the hands-on activity of filling the box they made to find volume” (Ms. Heather, Parent journal, 6/8). During our interview she told me that a few students yelled out the answer and she assumed that the others would not complete the activity as a
result. She was pleasantly surprised to see that most students continued to fill the box. She concluded that students enjoyed the activity, making it a good learning experience.

After another lesson, Ms. Heather said, “I liked how Ms. Blume used meter sticks with volunteers to hold the sticks to demonstrate the area of a cubic meter” (Ms. Heather, Parent journal, 6/8). She believed that using students as part of the lesson grabbed everyone’s attention. She also thought it gave the students a good visual representation of a cubic meter. Along the same lines, Ms. Heather commented on a teaching method I used to help students visualize angle measurements. I asked students to model different angles with their arms. Ms. Heather thought this was a good teaching method and suggested turning it into a game (Ms. Heather, Parent interview, 1/25, p. 6). It seemed important to Ms. Heather that students have fun in class, so she often suggested that students should have more opportunities to play math games.

After her first visit, Ms. Cutler commented on the use of individual slates at the beginning of class. She said, “To let the kids think they were kind of the teacher and they are part of the teaching plan. That is good” (Ms. Cutler, Parent interview, 11/10, p. 6). She liked the slates for two reasons. As this quote suggests, she thought they made the students feel like they were an important part of the lesson. She also noted that the slates allowed the teacher to quickly assess each student.

After a different visit, what stood out for Ms. Altman was “the use of the spinner as a tool to help the students visualize fractions/probability” (Ms. Altman, Parent journal, 3/10). We discussed this during our subsequent interview. She felt that the spinners (similar to those you find in board games) helped students figure out “how to get the
portions of the pie chart that they needed, then get the fractions that they needed and end
up with whatever number they needed to get...I think that was a great tool” (Ms. Altman,
Parent interview, 3/10, p. 2). She felt that students were able to use their background
knowledge, and they seemed excited to use the spinners. Based upon her observations
that day, she concluded that students learned quite a bit about fractions and probability by
using this tool.

All three of these parents also commented about a teaching method, repetition of
math exercises, they felt was lacking in the curriculum. During our first parent interview,
Ms. Altman said, “My thoughts around repetition were, not that I want to see them do it
every day...but I definitely think there are math skills that can be gained by doing that”
(Ms. Altman, Parent interview, 11/10, p. 4). We had this discussion after Ms. Altman
attended a lesson on decimals. She thought the students should have had more practice
ordering decimals and less time playing a math game.

Repetition of exercises came up during each of my interviews with Ms. Cutler.
Regarding working with fractions, she said, “They need to repeat it to get understanding”
(Ms. Cutler, Parent interview, 3/10, p. 4). She felt that the curriculum did not contain
enough lessons on fractions and moved on to other areas too quickly. After a lesson on
the area of a rectangle, we also discussed her view that the program did not utilize
repetition enough. She said, “When we were kids we were repeating and repeating and
then later we understand. It is worse from what you teach today. I think the more
important thing to do is more practice” (Ms. Cutler, Parent interview, 3/23, p. 4). On
On a few occasions, Ms. Heather expressed her opinion that the curriculum sometimes moved a bit too fast. For example, after a lesson on area, she said, “You are introducing, coming back, introducing and coming back and it clicks. But, it seems like it goes too fast. I think they should slow it down” (Ms. Heather, Parent interview, 3/23, p. 5). Similar to Ms. Altman and Ms. Cutler, she was reacting to a perceived lack of repetition. She felt that the curriculum moved to new content before the students were ready.

In reaction to this, Ms. Heather focused upon a teaching method I often employed to encourage students to slow down. In her journal, she wrote that I “asked the students to stop and think” (Ms. Heather, Parent journal, 12/8) as something that stood out for her that day. When we discussed this during our next interview, she said that she thought this method pushed the students to try a bit harder before asking for help. She also thought it gave them the confidence to work through their frustration. She said, “I thought it was great that you reminded the kids to try to think before searching for help, because it looked like they were working even harder... It gave them more confidence” (Ms. Heather, Parent interview, 12/8, p. 1).

Ms. Altman commented positively regarding elements of the curriculum that she noticed. I believe she focused on these because she felt they were lacking from her math education. Firstly, she commented on the use of the scientific method to help students grasp probability. She said, “I think it is a good skill for anyone to have. I think it is
good for students to learn this at such a young age” (Ms. Altman, Parent interview, 3/10, p. 4). We talked about her view that the spinner experiments that students completed were a version of the scientific method, and she thought it was a wonderful technique. The second thing she noticed was a teaching tool. After her last visit, when asked what stood out for her, she wrote, “One item of interest to me was the math word wall. I think it is very important that these students learn the language of math early on in their education” (Ms. Altman, Parent journal, 5/10). Ms. Altman felt that the direct teaching of vocabulary words in math class was beneficial for students, and she liked the math word wall as a tool. She felt that this would have helped her as a youngster.

Another way in which Ms. Cutler focused on teaching methods was to make suggestions regarding other ways to teach mathematics. During a discussion we had about fractions, she said, “I just realized now that maybe you can use a piece of square and give the scissors to each student to let them cut in order for them to understand their fractions” (Ms. Cutler, Parent interview, 11/10, p. 2). After observing a lesson on fractions, Ms. Cutler was not convinced that all of the students understood the content. So, she suggested an alternate teaching method. While she was in class during a lesson on area, she worked with a student who she felt was struggling. She told me, “I taught [him] that I use a piece of square on a paper and I cut it in half. I fold it in half and then I fold it in another half and I tell him, like, the length is half and the width is the other half and the area is a quarter and then he understands” (Ms. Cutler, Parent interview, 3/23, p. 4). She used her own teaching method with this student because she felt that the *Everyday Mathematics* method had not been effective.
I believe Ms. Cutler and Ms. Heather focused on teaching methods because they were skeptical of *Everyday Mathematics*. Ms. Cutler felt that the constructivist methods were vastly different from those used in her home country. She felt that her own math education had been successful and was distrustful of the methods she experienced during the study. Ms. Heather came to quite a few visits, and she did not gain a greater appreciation for the curriculum. In fact, she liked it less than she did before the study. She admitted to being set in her ways and had trouble embracing the constructivist approach. I believe this is why it was her main focus.

Ms. Altman focused on teaching tools and methods since they differed from what she experienced as a student. Although she felt the program lacked repetition, she mostly focused on areas that allowed her to gain a greater appreciation for *Everyday Mathematics*, such as the math word wall.

When I designed this study, I was curious what parents would notice. I argue that what they focused upon impacted the changes they experienced. (I explore this further in the following sections.) Each parent changed in his/her own way and I believe this is one of the reasons that the intervention was a success. If I had chosen their foci, perhaps participants would not have experienced as much change as they did.

**Changes**

In this section, I discuss the changes that parents experienced as a result of participating in the intervention. Analyses revealed that parents experienced changes in five distinct areas: beliefs about mathematics teaching and learning, understanding of *Everyday Mathematics*, appreciation of *Everyday Mathematics*, actions taken at home
and understanding of mathematical content knowledge. The following table summarizes which parent(s) coincide with each change.

Table 6

*Key changes by parent*

<table>
<thead>
<tr>
<th>Name</th>
<th>Changed beliefs</th>
<th>Learned about EM</th>
<th>Increased appreciation of EM?</th>
<th>Changed actions</th>
<th>Learned Math</th>
</tr>
</thead>
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<tr>
<td>Ms. Altman</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ms. Cutler</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ms. Heather</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ms. Brown</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Beliefs about Math Teaching and Learning**

Three of the parents in the core group changed their beliefs about math teaching and learning as a result of the study: Ms. Altman, Ms. Brown, and Mr. Goodman. Based on discussions I had with each of them, I assert that their initial beliefs came from their individual experiences with classroom math. Ms. Altman and Ms. Brown held beliefs mostly consistent with the way they had been taught. Mr. Goodman’s beliefs came from his experiences working with his sons.

One element of math teaching and learning that Ms. Altman and I discussed on a few occasions was repetition. She remembered that, during her Catholic school days, repetition was an important component of her math learning, especially when it came to
multiplication. After her first visit, she said, “I guess my thoughts around repetition were, not that I want to see them do it every day or be drilled all of the time…but I definitely think there are math skills that can be gained” (Ms. Altman, Parent interview, 11/10, p. 4). At that time, Ms. Altman was expressing her opinion that repetition is a necessary technique when it comes to teaching the multiplication facts. We revisited this idea during her exit interview. One of the statements on the parent questionnaire states, “It is more important for students to have the multiplication facts memorized than be able to solve problems.” Before her visits, Ms. Altman had no opinion regarding this statement. After her visits, she disagreed with it. She said, “I think that it is more important now, having seen it, that they are good mathematicians and can figure it out in their head and I guess my thinking is that speed will come in time” (Ms. Altman, Exit interview, p. 5). Visiting the classroom and focusing upon teaching methods allowed Ms. Altman to understand the importance of solving problems. She concluded that repetitive drilling of the basic multiplication facts is less essential and, in her words, students will learn the facts “in time.”

Ms. Altman initially had no opinion about the following statement: “The language and symbols of Everyday Math are difficult to understand.” At the end of the year, however, she disagreed with it. By coming into the classroom, Ms. Altman noticed the focus placed upon teaching the symbols and language used in Everyday Mathematics lessons. She expressed her appreciation for the math word wall in my classroom: “I am a firm believer that math is a language and if you teach the vocabulary, it is just that much easier” (Ms. Altman, Parent interview, 5/10, p. 5). In addition, during her exit
interview, she argued that it is "so important for kids to have the vocabulary of math" (Ms. Altman, Exit interview, pp. 4-5). Ms. Altman remembered being confused by the language used in math class as a student. Coming in to visit the classroom allowed her to see that the students did not struggle with the language and symbols of Everyday Mathematics since teaching them was an important part of each lesson.

Real world context is an area in which both Ms. Altman and Mr. Goodman changed their beliefs. At the beginning of the year, Ms. Altman had no opinion about this statement: "Most math problems fourth graders are given should use real world contexts." On the questionnaire at the end of the study, Ms. Altman agreed with this statement. She explains, "I think it helps the students. You know you are doing area problems and you are trying to measure carpet for your house and I think the kids can relate better to the math situation" (Ms. Altman, Exit interview, p. 4). During classroom visits, Ms. Altman's focus upon methods allowed her to notice and appreciate the use of hands-on problem solving, especially with problems set in real world context.

Mr. Goodman initially disagreed with the statement above regarding setting problems in real world contexts. However, he reacted positively to a lesson in which students measured and compared scale drawings of bugs. We discussed this discrepancy and, regarding real world context, he said, "I guess I would disagree with my prior statement. I would say that it is a great value to the kids" (Mr. Goodman, Parent interview, 12/2, p. 3). He was also enthusiastic about the use of kitchen scales during a lesson on weight. He thought that this served as "another avenue for them to understand the concept...they can start to build their knowledge and be able to draw from that
knowledge base to make perhaps estimates on other things" (Mr. Goodman, Parent interview, 5/27, p. 2). Visiting the classroom and focusing upon students' engagement allowed Mr. Goodman to understand the importance of using such contexts for math learning. At the end of the year, he strongly agreed with the statement on the questionnaire and he said, “The more that we are able to draw on their experiences it appears that the more engrossed they are...I really was not certain of that when we started but it became very obvious in the classroom” (Mr. Goodman, Exit interview, p. 3).

Mr. Goodman and Ms. Brown changed their beliefs about the benefits of student interaction. On his initial questionnaire, Mr. Goodman agreed with the statement “Discussion amongst students impedes learning.” After participating in the study, he strongly disagreed with it. He explains:

I had anticipated that they would digress and they would not stay on the subject. And I found, again through example from watching you and watching the kids in your class, that, in fact, that exchange was just so valuable...I thought it was amazing. (Mr. Goodman, Exit interview, p. 3)

As discussed in Chapter 1, discussion amongst students is an important element in standards-based classrooms. Mr. Goodman focused upon students while in the classroom and worked closely with many of them. Therefore, being part of student interactions allowed him to understand their importance.

Before participating in the study, Ms. Brown disagreed with the above statement regarding discussion amongst students. At the end of the study, she strongly disagreed, expressing that this change was a result of being present in the classroom. She said, “Now I actually think they get information from each other and I think it helps those that
are not real sure, you know like, that are a little bit timid about speaking up in the class” (Ms. Brown, Exit interview, p. 2). Ms. Brown focused on her son and his experiences during her classroom visits. She was pleasantly surprised to see how well her son and his good friend worked together and stayed focused. This convinced her that peer discussion can be powerful.

Mr. Goodman and I discussed peer interaction in the math classroom in great detail. At the beginning of the year, he did not think that the more proficient students should work with students who were struggling. However, after visiting the classroom a few times, he realized that the stronger students benefited from these interactions. He said, “For them to teach it, reinforces it in their minds” (Mr. Goodman, Parent interview, 4/28, p. 6). Along these same lines, Mr. Goodman initially disagreed with the statement “Children learn math best by working with their peers.” At the end of the year, he agreed. He said, “So, whereas before I was not certain of that exchange between the kids, whether that would be constructive or not, and seeing it in your classroom, it was very constructive in many ways” (Mr. Goodman, Exit interview, p. 2). These examples illustrate how Mr. Goodman’s beliefs about peer interactions changed over the course of the year, partially due to focusing upon students and how they worked with each other.

Ms. Brown and Mr. Goodman also changed their beliefs about manipulatives. Initially, Ms. Brown disagreed with the statement, “Fourth graders should work frequently with math materials.” After participating in the study, she agreed with it. We discussed the use of manipulatives during math lessons, and she said they “just seem to help and in the beginning I did not see all of that because I was never in the classroom”
Visiting the classroom allowed her to see firsthand how manipulatives helped students understand mathematical concepts. Since she saw how helpful manipulatives were in the classroom, she even began to use objects at home (such as pennies) to help her son with his homework.

Mr. Goodman also did not believe in the use of manipulatives before participating in the study. After his first visit, he explained what he thought about the chips we used in class that day. He said they were “invaluable...maybe more so for the kids who are struggling...it was definitely helpful for them” (Mr. Goodman, Parent interview, 11/10, p. 1). Mr. Goodman was surprised to feel this way. In fact, on his initial questionnaire, he strongly disagreed with the statement “Fourth graders should work frequently with math materials.” On his parent questionnaire at the end of the year, he strongly agreed with this statement. He said, “If we’re able to give them something tangible to relate to, it reinforces the subject. When I watched you and when I watched the kids, it became so obvious” (Mr. Goodman, Exit interview, p. 3). Mr. Goodman expressed to me that he didn’t think his sons benefited from the use of manipulatives. So, that is why he initially did not feel that they were beneficial for learning. Coming to the classroom and focusing on students caused both Mr. Goodman and Ms. Brown to change their views.

Each of the changes documented above depict parents’ beliefs shifting away from a procedure-focused view of math toward a standards-based one. I found one instance (among these three parents) of change in the other direction. Ms. Brown initially disagreed with the following statement on the parent questionnaire: “It is more important for students to have the multiplication facts memorized than be able to solve problems.”
At the end of the year, she agreed with this statement. She explained this: “Because it helps them work out the problem quicker. If they are still sitting there trying to figure it out they are spending a whole lot of time trying to figure out what six times three is rather than going along” (Ms. Brown, Exit interview, p. 3). Ms. Brown saw that struggling with math facts slowed some students (including her son) down. It is important to embrace the idea that inviting parents into the standards-based classroom is not always going to win them over.

Through my data sources, I found one belief about mathematics teaching and learning that my intervention did not seem to impact. Parents upheld the idea that students learn math best through repetition throughout the study. On the initial questionnaire of all parents, 95% of respondents agreed that students learn math best through repetition. This implies that parents viewed repeated practice of math exercises as an important piece of the learning process. This is not a teaching method employed by standards-based curricula such as *Everyday Mathematics*. Thus, I was curious to discover whether parents’ views regarding repetition would change as a result of the intervention.

Based upon the data that I collected throughout the study, I found that the core group of parents did not change their feelings about repetition. On the parent questionnaire, one statement reads, “Children learn math best through repetition.” Ms. Brown, Ms. Cutler, Mr. Goodman and Ms. Spiro did not change their responses to this statement. They all either agreed or strongly agreed before and after the intervention. Ms. Brown said, “I think there has to be practice in it in order for them to learn it more. I
mean, the more the better” (Ms. Brown, Exit interview, p. 3). Ms. Cutler and I spoke often about this topic. She expressed concern that this was a shortcoming of the curriculum, “This is the only part that I don’t like, because they need to do more exercises” (Ms. Cutler, Exit interview, p. 2).

Ms. Heather and Ms. Altman did change their views. Ms. Heather became more convinced that repetition was important, agreeing with the statement at the beginning of the year and strongly agreeing at the end. During her exit interview, we discussed her belief that students need more repeated practice in order to succeed in mathematics. On the other hand, Ms. Altman began to understand that the curriculum’s focus was on problem solving. She was the only parent who adjusted her beliefs around repetition away from a procedure-focused view, albeit slightly.

Knowledge of the Curriculum

Four of the parents in the core group learned about the *Everyday Mathematics* curriculum as a result of participating in the study. The amount that they learned depended upon the number of visits they attended.

**Mr. Goodman.** Mr. Goodman told me that he participated in the study because he wanted to help me. He did not realize that the intervention would be a valuable learning experience. After a number of visits, I asked him what he thought he was learning. He said he was “learning about the program, learning about the way kids learn, learning about the way teachers present the ideas, the way teachers teach” (Mr. Goodman, Parent interview, 1/25, p. 14). From the beginning, he was an enthusiastic presence in the classroom. He enjoyed being there and clearly benefited.
Mr. Goodman learned quite a bit about the *Everyday Mathematics* curriculum. On his initial questionnaire, he said that he knew a moderate amount about *Everyday Mathematics*. At the end of the year, he claimed to know more - "Being in there and seeing you I have learned so much more and I am sure I just touched on it. I mean there is so much to it" (Mr. Goodman, Exit interview, p. 7).

After a few visits, Mr. Goodman began to understand how the lessons are organized. He compared the sequence of activities with the scientific method. He said, "I see how much more important it is that the kids take the time to think about the problem conceptually and try and quantify it without going through a formula or a script and then to compare their answer to that initial hypothesis, that initial guess" (Mr. Goodman, Parent interview, 1/25, p. 8). Mr. Goodman appreciated the way the curriculum focuses on allowing children to build their own understanding, rather than focusing on procedures and memorization. I believe he was beginning to understand the constructivist nature of standards-based curricula and he valued it.

Mr. Goodman also made many comments regarding specific tools and teaching techniques endorsed by *Everyday Mathematics*. For instance, many lessons begin with slate time, during which each student has his/her own slate. The teacher presents a problem and each student writes his/her answer and displays it. Regarding such slate drills, Mr. Goodman said, "You know the kids who are struggling and you know the kids who have got it just by what they present to you. I thought it was awesome" (Mr. Goodman, Parent interview, 12/2, p. 1). The aspect he appreciated was that slate time was a quick way for me to see who needed a bit of extra help. Mr. Goodman also
commented positively about multiplication wrestling, a game presented by the program to introduce multi-step multiplication to students. He said, “It almost tricks them into learning” (Mr. Goodman, Parent interview, 12/8, p. 2). He was impressed with how quickly the students learned the game. For him, this served as proof that it was an effective teaching tool.

**Ms. Heather.** Similar to Mr. Goodman, Ms. Heather also participated in the study to help me. She came to nine visits and clearly learned quite a bit about *Everyday Mathematics*. As will be discussed later in the chapter, Ms. Heather did not learn to appreciate the program more. Instead, she found that she liked it less than she had before the study. She questioned the ease of *Everyday Mathematics* algorithms and wondered what was wrong with the “old way.” This will be discussed further below.

Prior to her participation in this study, Ms. Heather said she knew a moderate amount about *Everyday Mathematics*. She felt that this knowledge came from attending district-run workshops and using the Student Reference Book at home. After participating, she felt that she knew a lot and, therefore, was a better resource for her daughter (Ms. Heather, Exit interview, pp. 9-10).

When I asked Ms. Heather what she thought she learned about the curriculum by coming in to visit, she said, “It is clarifying a little bit of why they are doing what they are doing. So the process of throwing things out there and bringing it back and throwing it out there and bringing it back is making more sense” (Ms. Heather, Exit interview, p. 2). Ms. Heather’s comments were focused on the manner in which concepts are taught by *Everyday Mathematics*. The way the lessons are arranged, a concept (such as
equivalent fractions) is only studied for a few days and then a new concept is introduced. However, students work on equivalent fractions in various ways throughout the year and the concept is reviewed in fifth grade. This element of the curriculum, often called a spiral, is something that I have found is difficult for parents to understand. Coming into the classroom helped Ms. Heather see the reasons behind this structure.

Ms. Heather’s participation also allowed her to learn about specific elements of the curriculum. For instance, she loved the use of slates to practice math facts. She thought that they allowed the teacher to see who needed extra help (Ms. Heather, Parent journal, 12/8). Experiencing a lesson on long division provided clarification for Ms. Heather regarding an *Everyday Mathematics*’ algorithm. She said, “I understood it in the book, but when I actually did it in class today, I was understanding more of what was going on...Now I totally understand it” (Ms. Heather, Parent interview, 1/14, p. 2).

Having the opportunity to watch the teacher demonstrate and then to practice the algorithm in class allowed Ms. Heather to develop a deeper understanding of it. Ms. Heather also attended a class focused upon equivalent fractions. She thought the workbook page was helpful for students when it came to figuring out which fractions were equivalent. She said, “By looking at the colors and shading it in they could actually see the squares being equivalent and I think that made more visual sense to them” (Ms. Heather, Parent interview, 2/24, p. 3). Ms. Heather liked the way the curriculum not only used a visual representation, but also taught the students a quick method for finding equivalent fractions.
I have argued that Ms. Heather’s main focus during classroom visits was upon teaching methods and tools. Her focus and the fact that she attended so many visits both attributed to her learning quite a bit about *Everyday Mathematics*.

**Ms. Spiro.** Ms. Spiro attended three classroom visits, the minimum amount for consideration into the core group of participants. Therefore, she experienced less than Mr. Goodman and Ms. Heather. However, she also learned about the curriculum as a result of her visits.

On her initial parent questionnaire, Ms. Spiro said she knew a moderate amount about the curriculum. At the end of the year, I asked her if coming into the classroom helped her learn about the curriculum. She said, “I definitely did learn more and it made me more aware of so many things” (Ms. Spiro, Exit interview, p. 6). She did not feel that she knew “a lot” about the curriculum, but she felt she knew more.

Specifically, Ms. Spiro learned about the curriculum during the lesson on partial quotients. She said, “I was happy to get there to see it. I kind of thought I knew it, and then I knew that I knew it because I was able to help the kids with it” (Ms. Spiro, Parent interview, 1/14, p. 1). An important part of her experience that day was helping students with partial quotients. Doing so made her realize that she had a firm grasp on the algorithm. This fits nicely with my conjecture that as parents experience math concepts firsthand, they learn the procedures. While comparing partial quotients to the traditional method of dividing that Ms. Spiro had always used, she said, “I think this way is so much more basic and simpler. You just need to know your multiplication tables...I would do it this way before I ever even remember how I used to do it” (Ms. Spiro, Parent interview,
Mastering partial quotients allowed Ms. Spiro to understand and appreciate its ease. She was surprised to find that she liked this algorithm better than the traditional one that she had been taught.

**Ms. Cutler.** Ms. Cutler visited the classroom four times. She participated in the study in order to learn about the curriculum and teaching techniques. She hoped this would help her understand what and how her son was learning so that she could be a better resource for him at home.

Similar to Ms. Spiro, Ms. Cutler felt that she knew a moderate amount about the curriculum both before and after participating in the study. When I asked her if she felt she had learned about the curriculum, she said, “From visiting your class, I learned a lot” (Ms. Cutler, Exit interview, p. 3). She also felt able to use this knowledge to help her son at home.

During her exit interview, I asked Ms. Cutler how learning about the curriculum benefited her. She said, “It helped me to understand like what [my son] has learned in the school” (Ms. Cutler, Exit interview, p. 1). Various parents involved in the study expressed this same sentiment, coming into the classroom even a few times gave them a better understanding of what and how their kids were learning. Ms. Cutler told me that her son rarely needed help with homework. That is the main reason why she only knew “a moderate amount” about the curriculum at the beginning of the year. I speculate that her motive for participating influenced what she focused upon, teaching tools and methods. This focus, in turn, helped her learn about the curriculum.
Appreciation for the Curriculum

I speculated that coming in to experience standards-based mathematics lessons would cause parents to gain a greater appreciation for Everyday Mathematics. Within the core group, two parents almost certainly did. However, one parent who came to many classroom visits found that she liked the curriculum somewhat less than before the study.

Ms. Altman. As a result of attending three classroom visits, Ms. Altman gained a greater appreciation of the Everyday Mathematics program. After completing her visits, she said:

I have always liked it but I really did not understand it. I could not get a grasp on how it worked on an everyday level in the classroom...When I had the opportunity to come into the classroom and see it, I really learned to love the program and have greater appreciation for how it can be stimulating for students to learn math and the different techniques that can be used to help them grasp concepts that are sometimes hard for students their age to understand. (Ms. Altman, Exit interview, p. 2)

Interestingly, Ms. Altman did not feel that she learned more about the curriculum. As implied in the quote above, her increased appreciation came from having the opportunity to experience constructivist teaching methods. And, as discussed, her main focus during visits was upon teaching methods and tools.

Ms. Altman commented favorably upon concepts taught during one of her visits. Regarding the introduction of probability in fourth grade, she said, “I think it is just remarkable for them at this age to have the concept presented to them...and I think they grasp it” (Ms. Altman, Parent interview, 3/10, p. 5). In addition, she felt that the use of spinners in this lesson mirrored the scientific method, a process that in her opinion “is
good for students to learn at such a young age” (Ms. Altman, Parent interview, 3/10, p. 3). During this visit to the classroom, Ms. Altman focused on some of the complex concepts that are highlighted by the lesson. Also, she gained an appreciation for the *Everyday Mathematics*’ techniques used to teach such concepts to young students.

Two months later, Ms. Altman visited the classroom during a lesson on multiplying decimals. This lesson uses the *Everyday Mathematics* partial products algorithm. She wrote in her journal, “I like how the students are able to estimate the answer before working the problem as a check method” (Ms. Altman, Parent journal, 5/10). When I interviewed her regarding that visit, I asked her what she thought of the way students are taught to multiply decimals. She said, “It just seems long and convoluted... I think it is a very process-oriented way to do math, but it just sometimes seems inefficient.” (Ms. Altman, Parent interview, 5/10, p. 1). As much as Ms. Altman liked the program, especially once she saw it in action, there were still aspects of the curriculum that she questioned.

Ms. Altman’s focus during her visits was mostly upon teaching methods and tools. I believe this was because she perceived standards-based mathematics to be different than the approaches used in her schooling. Coming into the classroom and focusing on teaching approaches allowed Ms. Altman to learn about the curriculum and gain a greater appreciation for it.

**Mr. Goodman.** As Mr. Goodman got to know more about the program, he also learned to appreciate it more than he had before visiting the classroom. He stated, “I am much more impressed with the program in general by being exposed to it in so much
more detail and seeing you teach. Again, I have learned so much more about it and I am so much more impressed by everything about it” (Mr. Goodman, Exit interview, p. 1).

Before participating in the study, Mr. Goodman agreed with the statement, “I like the way math is presented by the Everyday Math curriculum.” At the end of the year, he said he would strongly agree with it. He explained, “It is able to present things in different ways that the kids can relate to. And I like the way it not only presents the concept in different ways, but it reinforces it with examples...There are so many aspects that are phenomenal” (Mr. Goodman, Exit interview, p. 8). Mr. Goodman was a proponent of the curriculum before this study. However, having the opportunity to participate in various lessons throughout the year allowed him to learn more about the program. As a result, his appreciation for Everyday Mathematics grew.

Mr. Goodman also changed his view regarding the difference between the way he learned math and the way math is taught at Monroe. At the beginning of the year, he agreed that there was a difference. After his visits, he said he would strongly agree. He elaborated:

It is so much more methodical. There is such an effort to try and bring a concept or present a concept in a way that the kids can appreciate. I don’t remember it being that way. I don’t remember it being so methodical and so much care put into the way it is presented and how it is presented and the step by step progression... It is more interesting and is able to relate to so many more kids in so many different ways. (Mr. Goodman, Exit interview, pp. 6-7)

Many parents in the study actually found more in common with the way math is presented to their children and the way they learned. They concluded that the curriculum did not present things as differently as they thought, and they seemed to like that. Mr. Goodman decided that the teaching techniques are vastly different than those he
experienced, in a positive way. He learned to appreciate the “step by step progression” found in *Everyday Mathematics* lessons.

One thing that Mr. Goodman said on at least two occasions has an important place in this discussion. Around the middle of the year, I asked him, having visited the classroom a few times, what he thought of the curriculum. He said, “I think what I see is phenomenal, and what I don’t understand necessarily is what part is you and what part is the program” (Mr. Goodman, Parent interview, 1/14, p. 15). These two things cannot be completely teased apart. The way teachers implement curriculum can vary from classroom to classroom. Both in the data collection process and in the evidence I used, I have tried to focus on the curriculum. However, this is something to consider. Are parents responding to the curriculum or the teaching?

**Ms. Brown and Ms. Spiro.** Appreciation for the curriculum was not something that I discussed often with Ms. Brown or Ms. Spiro. However, I asked them about it during their exit interviews. Ms. Spiro said, “I love it. I think it is great and I don’t know if I would have felt that way if I did not come in...It is really nice to go in and see how you guys really relate to the kids and you figure out a way to get to them and I like that” (Ms. Spiro, Exit interview, p. 8). Although she only attended three classroom visits, Ms. Spiro responded positively to what she observed. She expressed her feeling that coming into the classroom caused her to gain some appreciation for *Everyday Mathematics*.

On her initial questionnaire Ms. Brown agreed with the statement, “I like the way math is taught at Monroe.” During her exit interview, she told me that she would now strongly agree. When I asked her to elaborate, she answered, “I agree with the whole
lesson and the way it is planned and the way they work at it and the way they practice it with their peers and the practice that you give them in class. You ask the kids, how would you do it? Not this is how you do it and that is it" (Ms. Brown, Exit interview, p. 8). Experiencing the constructivist approach caused Ms. Brown to gain a deeper understanding and appreciation for the way each lesson functions.

Ms. Heather. My conjecture was that, as parents learned more about the curriculum, they would express a greater appreciation for it. For Ms. Heather, this was not the case. Although Ms. Heather was an enthusiastic participant, she had two main critiques regarding the curriculum that came up again and again in our conversations. Based upon these, it is clear that she changed the way she feels about the curriculum in a negative way.

Ms. Heather felt that the curriculum moved too quickly. She said, "I think the math program is wonderful, but I think they are squeezing so much in so fast" (Ms. Heather, Parent interview, 12/2, p. 5). For instance, after experiencing the lesson on the formula for the area of a rectangle, she said, "The rule, it was the most important part, and they figured it out. I just think they went a little too fast for them" (Ms. Heather, Parent interview, 3/23, p. 2). Ms. Heather was concerned that spending one day on this concept was not enough and students needed more practice. Along these lines, she often made comments about students who were struggling. She wondered if the pace of the curriculum was too fast for some children, and she worried about what would happen to them in later grades.
Another critique Ms. Heather voiced numerous times was that she thought the program should incorporate traditional algorithms. In the parent journal, she was asked what surprised her about partial quotients (Everyday Mathematics' algorithm for long division). She wrote, "How this way, instead of the way I was taught, might be better to start with. Then go to the old way" (Ms. Heather, Parent journal, 1/14). During one of our interviews, I asked about this. She said, "There is more adding up and adding up. I just like the old fashioned way of division...It is hard to teach an old dog new tricks" (Ms. Heather, Parent interview, 5/10, p. 2). One of my conjectures was that, once parents experienced firsthand the different teaching tools (such as partial quotients) used by the curriculum, they would learn to embrace them. That was not the case in this example. Ms. Heather came to a better understanding of the algorithm, and she endorsed its use. However, she also suggested that the curriculum should use the traditional method of long division once the kids mastered partial quotients.

Although Ms. Heather learned more about the curriculum as a result of participating in the study, she did not appreciate it more. At the beginning of the year, she agreed with the statement, "I like the way math is presented by the Everyday Math curriculum." When I asked her if she would still agree, she said she likes the program "a tad less" and went on to say, "I still think they still need to do some more research, maybe even incorporate some of the old ways" (Ms. Heather, Exit interview, p. 2). In addition, she thought there was not enough repetition and students were allowed to use calculators too much. Ms. Heather was an enthusiastic participant, and she often told me
how much she enjoyed being in the classroom. However, as she expressed to me on many occasions, she did not always agree with the *Everyday Mathematics* approach.

**Assistance at Home**

As noted in the theoretical framework, an important underlying assumption associated with this study is that beliefs affect actions. I argued above that coming into my math classroom caused parents to change their beliefs about mathematics teaching and learning. I speculated that these belief changes would cause parents to alter the way they worked at home with their children. In this section, I present the data for the five core parents who changed their actions. Some of these changes correspond with changes to parents’ belief systems, and some do not. In this section, I will also use Jinfa Cai’s (2003) research, discussed in Chapter 4, to categorize the roles parents assume while assisting their children with mathematics.

**Ms. Brown.** Before participating in the study, Ms. Brown and her son struggled with homework. She did not have confidence in her mathematical abilities and felt unprepared to help him. Visiting the classroom taught Ms. Brown mathematical content that she was then able to apply during the homework process.

Participating in the study helped Ms. Brown discover techniques that she could use at home. After her first visit to the classroom, she said, “Tonight for homework, he said, ‘Could you read this direction to me because it seemed to help me when you read it to me when we were working in the groups?’” (Ms. Brown, Parent interview, 11/10, p. 3). As a result of having his mom in the classroom, Ms. Brown’s son realized that it helped when she read him the directions. So, they tried it at home.
During the study, Ms. Brown began encouraging her son to be more independent at home with his math homework. She told me that, while in the classroom, she noticed her son relying on his friend for help. This pattern mimicked what happened during the homework process at night. She decided to encourage him to try harder before asking her for help. She told me what she said to him: “Do what you know you can do and if you want me to read something to you I will read it to you. But, try to do it on your own and then we will go back to the parts that you either could not do at all, or you felt that you did, but you were not so sure about” (Ms. Brown, Exit interview, p. 6). Being in the classroom and working with her son allowed Ms. Brown to see that he did not need as much help as she thought. In fact, he often knew the correct answer without any assistance. By coming to visit the classroom and focusing on her son’s needs, Ms. Brown concluded that her son needed to be more independent with his work. So, she changed the way she worked with him at home.

In the beginning of the year, Ms. Brown disagreed with the use of manipulatives in fourth grade. After the study, she agreed with their use since she had seen them help her son (and others) in class. During our exit interview, Ms. Brown and I linked this belief change with an action change; she began to use items, such as pennies, when working with her son. She said, “Yeah, we will use pennies or something else…This just seems to help and in the beginning I did not see all of that because I was never in the classroom” (Ms. Brown, Exit interview, p. 3). Ms. Brown felt that using manipulatives helped her son when it came to problem solving and enhanced his mathematical understanding.
Another change Ms. Brown implemented was incorporating mathematical discussion throughout the day, such as during a trip to the supermarket. She agreed that this change was a result of experiencing discussions in the classroom. She said:

Like when you go to the store, how much change approximately do you think you are going to get back if you give them this and it costs this much? Just things like that where I don’t think I did a whole lot of that and I probably need to do it more often, but I am thinking on those terms. (Ms. Brown, Exit interview, p. 5)

She began to use math in this way more after coming in to visit the classroom. By making this change, she believed that she was encouraging her son to think mathematically, thus strengthening his skills.

Based upon Ms. Brown’s questionnaire responses and the data I collected during our interviews, I argue that, prior to the study, she mostly gave her son direct forms of assistance. The three actions she “always” did were help study for tests, check homework and contact the teacher with issues. These are the three actions that correspond with Cai’s (2003) direct roles of content advisor and learning counselor. Ms. Brown now works with her son more indirectly. She encourages him to be more independent, to use manipulatives and to think about math throughout the day. These actions represent the indirect roles that Cai called resource provider and monitor.

Ms. Cutler. Ms. Cutler’s son did not usually need help with his homework. However, Ms. Cutler participated in the study in order to become more of a resource for him.

In response to the statement, “Most math problems fourth graders are given should use real world contexts,” Ms. Cutler had no opinion before the study. After participating, on her final questionnaire, she agreed with its use. She said, “I changed my
mind because at first I really had no idea” (Ms. Cutler, Exit interview, p. 5). Due to this belief change, Ms. Cutler began to give her son real world examples about which they could have mathematical discussions. For instance, if they were at the supermarket, she would ask her son to help figure out how much to pay or how much change she would receive. Before participating in the study, Ms. Cutler had only given her son extra math exercises on paper. After, she tried to incorporate real world context in order to make the work more meaningful. She believed that doing so increased her son’s mathematical content knowledge.

During our exit interview, I asked Ms. Cutler about two of the statements on the initial parent questionnaire. They were “Ask your child to explain how they solved a problem” and “Encourage your child to solve the homework problems in a different way.” For each statement, Ms. Cutler said she never did these things. After visiting the classroom, she felt that she sometimes did them. When I asked her why she thought this changed, she said, “Because I came to the classroom, because I know what you teach them and the way they learn. So I want to talk to [my son] about this and want to have [my son] explain to me” (Ms. Cutler, Exit interview, p. 5). As a result of focusing on teaching methods and tools, Ms. Cutler found herself using similar methods at home with her son. Specifically, they began discussing math problems. Since her son did not need help with his homework, this was a way for Ms. Cutler to work with him and enrich the homework process at home.

Prior to the study, Ms. Cutler did not consider herself an important part of her son’s math education since he did not need help with homework or studying. However,
Ms. Cutler wanted to know more about how her son was learning in school so that she could become a resource for him. Since participating in the study, she began discussing solutions to math problems and utilizing real world context with him. She also stopped giving her son extra arithmetic problems in an attempt to enrich the homework process. Thus, she not only began to take on Cai’s (2003) indirect roles called monitor and resource provider, but she also moved away from a previous, more direct form of assistance.

**Mr. Goodman.** Mr. Goodman participated in the study not only to assist me, but also to benefit his kids. He hoped to depict the importance of helping others. However, he also learned to relate to them better when it comes to mathematics.

On the initial questionnaire, Mr. Goodman indicated his belief that discussion amongst students can impede math learning. Due to his participation in the study, he changed his mind, coming to understand the importance of discussing mathematics. As a result, he claimed to learn “how better to communicate with” (Mr. Goodman, Exit interview, p. 5) his two sons. Mr. Goodman agreed that this belief change had a positive impact on their exchanges related to math. Experiencing discussions in the math classroom showed him the value and power of talking about math. Based on our interviews, I argue that Mr. Goodman learned to talk with his sons about mathematics, compared to his previous method of talking at them.

Initially, Mr. Goodman disagreed with the statement regarding real world context. After participating in the study, he strongly agreed with it. As a result of this belief change, he began to use more real world examples with his sons. He said, “I am always
challenging [my sons] with, many times, only conceptual things, only things in theory and not bringing in the tangible. Just seeing you do it with the kids and listening to kids and then trying it on [my sons] has really helped us as well” (Mr. Goodman, Exit interview, p. 4). Mr. Goodman used some of the strategies he saw in the classroom with his kids at home and was pleasantly surprised to find that they worked.

Mr. Goodman also expressed that coming into class helped him understand what his kids should be able to do and with what they may struggle. He said:

Before, I really struggled with what is tough for them and what is too easy and what is just right for them. And seeing the exchange between you and the students and being exposed to the math program in more detail has helped me better understand where they are and how better to communicate with them. (Mr. Goodman, Exit interview, p. 5)

One of my conjectures was that, as a result of experiencing what happens in the classroom, parents would be able to help their students more effectively at home. Mr. Goodman’s sons were in the accelerated math classes and did not need a lot of help at home. However, participating in the study caused Mr. Goodman to change the way he challenged them with math. He said, “I am more sympathetic and try different things to help them better understand some things because of the exposure in the classroom by watching you and seeing the way that you do it” (Mr. Goodman, Exit interview, p. 5). Experiencing the classroom and focusing on students (of all levels) gave Mr. Goodman insight into more effective ways to approach his sons.

Mr. Goodman has a strong math background and was already a wonderful resource for his two sons. However, participating in the study caused him to change his actions and his roles when working with them at home. Using Cai’s (2003) terminology,
he is a resource provider when he employs real world context, and he is a motivator due to his efforts to better communicate and relate to his sons.

Initially, I assumed that students (and parents) who struggled with mathematics would benefit most from changing their actions. Mr. Goodman and Ms. Cutler serve as examples of the opposite end of the spectrum. Participating in the study helped them relate to their children better, even though the parents had strong math backgrounds and the children did not struggle with school math.

Ms. Heather. Participating in the study allowed Ms. Heather to become more of a resource for her daughter when it came to math. After her first visit, we discussed this and she said, “I need to work a little bit more with my daughter...I kind of forgot what she really needs and what her strengths and weaknesses are” (Ms. Heather, Parent interview, 11/10, p. 2). Specifically, being in the classroom taught Ms. Heather about her daughter’s math strengths. After a lesson on angles, she realized that her daughter is a “geometry person” and maybe not an “algebra person” (Ms. Heather, Parent interview, 1/25, pp. 3-4). She expressed her feeling that she would not have realized this if she hadn’t participated in the study. Focusing on her daughter and seeing what other students could accomplish gave Ms. Heather new insights about her daughter’s math abilities.

Prior to the study, Ms. Heather’s husband had been helping their daughter with her math homework. Therefore, she rarely asked her mother for help. During the study, Ms. Heather attended nine classroom visits. Throughout this time, her daughter began to view her as more of a mathematics resource. Ms. Heather said, “Her first thing would be running to dad and now, with being in class, she will come to me...So now she will wait
and know that she can come to me and I will be able to help her” (Ms. Heather, Exit interview, pp. 3-4). Ms. Heather realized that, even though she did not do math homework with her daughter, she could still be an integral part of her math learning outside of school. She found that it was easy to incorporate mathematical discussions into their daily routine and to take advantage of other opportunities, such as playing games, to practice mathematics. Ms. Heather and I discussed the fact that her daughter now has two resourceful parents instead of one when it comes to mathematics; she was very proud of this change.

Ms. Spiro. Similar to Ms. Heather, Ms. Spiro’s husband usually did the math homework with their daughter. Since Ms. Spiro was available during school hours, however, she was the one who participated in the study. In her words, doing so, “gave me a better grasp on how she is learning and that made me feel better” (Ms. Spiro, Parent interview, 12/8, p. 6). Being involved in lessons and working with other students educated her regarding what fourth graders should be able to achieve.

Ms. Spiro felt that she was learning about her daughter’s math education and proficiency. This caused her to think about how she worked with her at home. Regarding coming into class, she said “it gave me more confidence. I knew what she was doing and what she was being taught and then I knew how to approach it with her” (Ms. Spiro, Exit interview, p. 4). Ms. Spiro did not feel involved at home for two reasons. First, her husband was in the field of education. Second, math homework was always a father and daughter bonding time that her husband truly enjoyed. She did not want to get in the way of this. However, participating in the study gave her ideas about ways she
could become more involved. For instance, she said, “In fifth grade I am going to follow...what subject matter they are on so I can make that part of my daily and weekly routine” (Ms. Spiro, Exit interview, p. 6). Ms. Spiro realized that she could work with her daughter without it being directly related to homework.

At the beginning of the year, Ms. Spiro was unsure about discussion in the math classroom. She worried that the students might confuse each other. However, once she observed students in action, she began to understand how helpful it can be to discuss mathematics. She said, “I guess that was something I am glad that I saw and I changed my mind about that...I struggled with math so I see that having somebody to work it out with, right or wrong, is good” (Ms. Spiro, Exit interview, p. 6). This belief change caused her to begin having math-related discussions with her daughter. She began to do so throughout the day and was thrilled to be an integral part of her daughter’s math learning.

Due to her participation in the study, Ms. Spiro changed her interactions with her daughter around math. She began finding ways to introduce math activities to her at home and to discuss mathematics as it relates to daily life. Comparing the changes she has made to Cai’s (2003) roles, Ms. Spiro began to assume the indirect roles of resource provider and motivator. Prior to the study, she felt that she did not have a role in her daughter’s math learning at all.

Knowledge of Mathematical Content

My speculation was that, as parents spent time in my classroom, they would not only learn about the curriculum, but also learn (or relearn) mathematical content. This
idea came from my experience preparing for Everyday Mathematics lessons during my first few years of teaching fourth grade. I found that there was often mathematical content with which I needed to review before I was prepared to teach.

Only one parent learned a significant amount of mathematical content as a result of participating in the study. During our conversations, Ms. Brown often expressed to me that she was not confident with her mathematical abilities. Visiting the classroom not only helped her learn, but also boosted her confidence.

During her first visit, Ms. Brown learned about decimals. She sat with her son and his friend while they worked in their math books and was surprised to find that she “was actually learning from” the other student (Ms. Brown, Parent interview, 11/10, p. 3). We talked about Ms. Brown’s struggle with decimals after she did homework with her son that night. She said, “I think I am getting it a bit better. I looked at some of the ways that you were doing it today…and now it is, like, coming back” (Ms. Brown, Parent interview, 11/10, p. 1). Ms. Brown did not feel that she understood decimals well and coming to class helped her quite a bit. She found the homework process to be much more enjoyable that night.

After the next time she came to visit, Ms. Brown said:

Just sitting there listening to you and seeing that so many of your kids get it, that is when I felt their parents must be smarter and they can help them understand it and I could not do that. I just could not get it. I do get it now. I do understand it now and it was not that hard. (Ms. Brown, Parent interview, 12/2, p. 3)

That day in class, we had worked on converting amongst metric units. Ms. Brown felt much more confident as a result of coming in to visit the classroom that day. After a later
lesson on fractions, Ms. Brown said, "I actually looked forward to the homework ... I was actually able to help him...I felt really confident about it" (Ms. Brown, Parent interview, 2/9, p. 7). In fact, she felt so confident that she offered to help another parent who was struggling with decimals and was unable to come to class that day.

Ms. Brown is a perfect example of how a parent can become a more effective resource for her child's math learning. She participated in the study because she wanted to be able to help her son with math. By focusing on him and sitting with him while he worked, she learned quite a bit of math and gained the confidence needed to help him with homework. During her exit interview, when I asked what she thought she gained from participating in the study, she said, "I got a lot out of it. It just made me feel better coming home and sitting and doing the lesson" (Ms. Brown, Exit interview, p. 11).

**Overall Finding**

The qualitative data discussed above support my assertion that being present in my standards-based mathematics classroom would be valuable for parents at Monroe. As described above, it was helpful in different ways for different parents.

Overall, I argue that there were three main benefits participants experienced. First, five out of the six core parents learned about the curriculum. This aligns with my speculation that, as parents spent time in the classroom, they would come to a deeper understanding of *Everyday Mathematics*. Second, five out of the six core parents also changed the way they participate in their children's math learning at home. They did so in various ways, a few which were surprising to me. For instance, Mr. Goodman gained a better sense of what fourth graders are able to do mathematically. In turn, he learned to
relate better to his two sons. Lastly, parents’ beliefs changed as a result of being present in my classroom. For the most part, their beliefs became more consistent with standards-based mathematics.

In the next chapter, I focus more deeply on the changes parents experienced to their beliefs and actions. I also develop and present a theory to explain these changes.
Chapter 6: Discussion and Conclusion

The research questions that drove my intervention focused on parents’ beliefs about math teaching and learning and their understanding of Everyday Mathematics, the standards-based curriculum at Monroe. We know from research that parents of elementary school students are often confused about standards-based curricula (Abreu & Cline, 2005 and Remillard & Jackson, 2006). According to Lehrer and Shumow (1997), this is due to the misalignment between the “construction zones” of home and school. They argue that aligning the two zones would allow parents to navigate school math more effectively. I wondered if parents spending time in my classroom might begin to align home and school for participants. Thus, I set out to study what would happen to parents’ beliefs and understanding as a result of their participating in my intervention. Also, I set out to study whether parents would change the way they work with their children at home.

Summary of Findings

My survey analysis, discussed in Chapter 4, suggests that, in general, fourth grade Monroe parents were supportive of Everyday Mathematics. Parents reported that they understood and liked the curriculum, even though they were taught math through different approaches. This group of parents also endorsed teaching strategies that align with standards-based approaches. For instance, more than 90% of the parents agreed that students should learn to solve problems in multiple ways and three-quarters of them supported setting math problems in real world contexts.
Researchers have documented parents’ frustration and confusion when it comes to standards-based mathematics (Abreu & Cline, 2005 and Remillard & Jackson, 2006). Thus, the overall positivity amongst the responses surprised me. I first wondered if the survey results were influenced by selection bias; parents who are unhappy with the Everyday Mathematics curriculum may have opted to not complete the questionnaire. However, my experience as a teacher in the district for almost ten years suggests that this may not be the case. I have experienced primarily positive feedback from parents regarding the math curriculum.

Questionnaire data also revealed that Monroe parents tried to be involved in their children’s learning of mathematics outside of school. Based upon their responses, I assert that they were more likely to provide what Cai (2003) called direct assistance, such as checking homework and studying with their children, rather than indirect forms of assistance, such as introducing math-based activities. This was an area I was looking forward to delving into with parents to see if they made changes as a result of participating in the intervention.

As laid out in Chapter 5, six parents visited my classroom at least three times throughout the intervention. These core parents experienced three main changes as a result of participating in the study. First, half of the parents in the core group substantially changed their beliefs about mathematics teaching and learning. They discovered the importance of math problems set in real world contexts, peer interaction and discussion, and the use of manipulatives. I argued in Chapter 5 that these changes
depict parents’ beliefs becoming more in sync with standards-based approaches to teaching math.

Second, five of the six parents learned about the *Everyday Mathematics* curriculum and four of them came to appreciate the approach more than they had prior to the study. I argued in Chapter 5 that, amongst the parents who learned about *Everyday Mathematics*, the knowledge gained correlated with the number of visits. The more a parent was able to view, the more he/she learned. For the four parents who came to appreciate the curriculum more, I believe it was the act of experiencing lessons in action that led parents to change. As discussed, one of the core parents concluded that she liked the curriculum a bit less than she had prior to the study.

Last, five core parents changed the way they work with their children outside of school. To borrow terminology from Cai (2003), they began to move away from assisting their children directly, toward providing more indirect assistance. Cai argued that this type of help is more effective when it comes to student success. Shumow (1998) found that, as parents learned about children’s cognitive reasoning abilities, they changed the way they assisted their children at home. Specifically, parents began to offer assistance “that supported children’s self-regulation and kept children constructively involved in problem-solving” (p. 123). My intervention did the same for the families who participated.

**An Expanded Theory of Change**

One of the goals for this study was to explore the relationship among parents’ beliefs, understandings and actions. Drawing on a constructivist framework (Palincsar,
I speculated that opportunities to learn about the mathematics curriculum as it was practiced in my classroom would increase parents’ understanding of it and change their beliefs about it. I further speculated that changes in parents’ beliefs about mathematics education would lead to changes in the way they worked with their children at home. As the above summary indicates, I found that this prediction played out with respect to parents and some of their ideas about teaching and learning math. But, it also suggests that the picture is more complex than I anticipated.

Changes to Actions that Coincided with Belief Changes

Constructivism serves as a framework for explaining the process of change that parents encountered during the intervention. Being in the classroom and experiencing standards-based lessons were new for parents. According to Piaget’s theory of disequilibration, when a person has a new experience, it can lead him or her to “question his or her beliefs and try out new ideas” (Palincsar, 1998, p. 350). When parents came to a classroom visit, they were introduced to different ways of thinking about mathematics. According to Piaget’s theory, these new experiences caused parents to question their beliefs and try out new ideas.

Some of the action-based changes that parents experienced, discussed in Chapter 5, coincided with belief changes. This coincidence was anticipated by the theory of change behind my study, as depicted in the concept map. I speculated that parents would visit my classroom numerous times throughout the year, participating in whatever manner they chose. As a result, parents would change their beliefs about mathematics teaching.
and learning. Due to these belief changes, parents would enact subsequent changes in the way they worked with their children at home.

This pattern of belief-driven change in action is found in the following changes documented by my data sources (discussed at length in Chapter 5). Ms. Cutler and Mr. Goodman changed their beliefs about the concept of real world context and began to use it at home with their children. Ms. Brown's newfound views on manipulatives caused her to use them with her son at home. Ms. Spiro, Ms. Cutler and Mr. Goodman, after coming to understand the importance of discussing mathematics, began to converse with their children about math in ways they had not before the study.

**Changes to Actions that Do Not Coincide with Belief Changes**

The phenomenon of belief-driven change described above explains approximately half of the action-based changes I found. For the other changes, there are no corresponding belief changes documented in my data. I considered the possibility that there are corresponding belief changes that I simply did not find. Due to the nature of these action-based changes, I did not believe this to be the case. In order to understand how these changes occurred, I listed all of them, noting which parent(s) coincided with them. This simple act allowed me to see that each of these changes corresponded with a practice, not with a belief.

Attending classroom visits allowed participants to experience mathematics teaching and learning in action. They saw what the teacher did and what the students did. Perhaps most importantly, they sat with students and became part of classroom practices. Each parent had unique experiences during these visits. I argue that these experiences
with mathematical practice led parents to introduce some of the changes they made at home.

During her visits to the classroom, Ms. Brown often worked with her son during partner and independent work time. One evening, she explained to me how she and her son discovered a simple technique. During a classroom visit, Ms. Brown and her son were confused about a math task. So, she reread the directions on the page out loud. This helped clarify the task for both of them. Later that night, they used this practice to help with homework. Rereading directions out loud became a useful part of their routine when they had difficulty.

Being present in the math classroom also allowed Ms. Brown to see how her son and his friend worked during partner time. She explained that she watched as the friend gave her son what she considered too much help. Watching this interaction from the outside led Ms. Brown to conclude that she also gave her son too much assistance. As a result, Ms. Brown encouraged her son to be more independent with his math homework, to persevere on his own before asking her for help. She found that he was able to do quite a bit without her assistance; this made both of them proud.

Both Ms. Brown and Ms. Heather reported that they began discussing mathematics with their children as a result of participating in the study. They both believed they made this change because of experiencing discussions in the classroom between me and the students and amongst groups of students. According to survey data, both women believed in the use of mathematical discussion as a teaching tool prior to the study. Only after coming in for lessons and being part of this technique in practice did
they begin to use this approach at home. Ms. Brown believed that this new approach strengthened her son’s skills by focusing on mathematics more often. Ms. Heather appreciated being able to participate in her daughter’s learning without infringing upon homework time, her husband’s territory.

Ms. Heather attended nine classroom visits. During many of these lessons, she sat down and worked with her daughter, something she had not done in quite some time. Ms. Heather explained to me that this practice taught her about her daughter’s math strengths and weaknesses. It also encouraged her daughter to approach her with math-related questions. Ms. Heather realized the importance of becoming a mathematical resource for her daughter.

Due to her participation in the study, Ms. Spiro also found new ways to connect with her daughter around mathematics. Experiencing lessons firsthand was enjoyable for her and she felt empowered to share that joy of mathematics with her daughter. She explained to me that she began to find ways to become more involved in her daughter’s math learning outside of school, without interfering with the homework process (also her husband’s territory).

When visiting the classroom, Mr. Goodman worked with children of varying mathematical abilities. This new practice allowed him to understand what an average fourth grader can do when it comes to math. Mr. Goodman claimed that this taught him to communicate better with his sons around mathematics. He also attributed this to examining teacher-student exchanges during lessons. The following table summarizes
the changes participants made at home, categorizing them as either belief-driven or practice-driven.

Table 7

Changes Categorized by Cause

<table>
<thead>
<tr>
<th>Belief-driven changes</th>
<th>Practice-driven changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Cutler and Mr. Goodman began to use real world context at home.</td>
<td>Ms. Brown began reading directions out loud to her son.</td>
</tr>
<tr>
<td>Ms. Brown started using manipulatives with her son.</td>
<td>Ms. Brown encouraged her son to work more independently.</td>
</tr>
<tr>
<td>Ms. Spiro, Ms. Cutler and Mr. Goodman started to discuss mathematics with</td>
<td>Ms. Brown and Ms. Heather started to discuss mathematics with their children in new ways.</td>
</tr>
<tr>
<td>their children in new ways.</td>
<td>Ms. Heather and Ms. Spiro became mathematical resources for their daughters.</td>
</tr>
<tr>
<td></td>
<td>Mr. Goodman found more effective ways to communicate with his sons around math.</td>
</tr>
</tbody>
</table>

My original speculation was that changes in beliefs would cause changes in action. The patterns described above suggest that parents made some changes as a result of viewing or participating in mathematical practices in my classroom. I now wonder if making such changes could lead parents to change their beliefs. If, for instance Ms. Brown did not believe in discussing mathematics as an approach to learning, might her success with it at home change her view? According to McLaughlin (1990), when it comes to creating change in our schools, belief can (and often does) follow practice. Synthesizing research on teachers’ use of new programs in their classrooms, she argued that “individuals required to change routines or take up new practices can become believers” (p. 13). Although the parents in my study were not required to make changes at home, the overall message has an important place in this discussion. Changing
practices at home may cause parents to change their ideas about math teaching and learning. Unfortunately, I did not collect data around this idea; it would be interesting for future research.

**Learning through repetition, a persistent belief?**

One of the statements on the parent questionnaire was, “Children learn math best through repetition.” Ninety-five percent of the Monroe parents who completed the initial questionnaire agreed with this statement. In my analysis, I argued that this was an area for which parents held traditional views of mathematics teaching and learning. I was anxious to find out if the parents who participated would change their views. According to the second questionnaire, for the most part, they did not. The fact that I found so little change gave me cause to examine this belief more closely. What I have concluded is that the issue of repetition is much more complex than I understood prior to the study.

My use of the word “repetition” on the questionnaire was problematic. According to the Center for the Study of Mathematics Curriculum (2004), NCTM recommended in the *Standards* (developed in 1989) that:

> Decreased attention was to be placed on the rote use of symbols and operations, and increase attention placed on number sense, estimation, and reasoning. Teaching thinking skills for basic facts, mental computation, and the use of calculators for complex calculation replaced tedious practice with pencil-and-paper algorithms and rote memorization of basic facts. (p. 5)

The word “rote” appears twice in this quotation. Webster’s dictionary defines learning by rote as, “the use of memory usually with little intelligence” and “mechanical or unthinking routine or repetition.” The above implies that mathematics curricula developed prior to the *Standards* utilized teaching through rote. NCTM is calling for
“decreased attention” to be placed upon this method. My understanding is that NCTM is not suggesting that all forms of repetitive learning be ceased. But rather, it recommends shifting away from rote and toward more active forms of learning.

Stein, Smith, Henningsen and Silver (2000) articulated a distinction between procedures with and without connections. They identified mathematical tasks requiring lower levels of cognitive demands as “procedures without connections to understanding, meaning, or concepts” (p.12). Their example of such a task was memorizing common fractions and their equivalent decimals, such as one-fourth is equal to 0.25. Procedures without connections lead to rote learning. These are the types of mathematical tasks I envisioned when I used the word repetition in my survey.

Stein et al. (2000) defined procedures with connections as those that would require higher levels of cognition and would build “connections to underlying concepts and meaning” (p.12). Such tasks are prevalent in Everyday Mathematics. For instance, fourth graders create pictorial representations by shading grids. This allowed them to visualize the relationships among fractions, decimals and percents and understand the meaning of equivalent values. Students repeated this “procedure with connection” various times in different ways. Although I would not categorize such an activity as repetition, perhaps the parents did. If a parent understood this to be an example of repetition, agreeing with repetition as a teaching tool did not contradict their appreciation for standards-based mathematics. I did not consider this when I wrote the questionnaire or during the interview process. If I could rewrite my survey question, I would use the word “rote,” rather than “repetition.” I would also ask parents for their opinion on the
following statement, "Repetition is a teaching tool employed by the Everyday Mathematics curriculum." Finally, I would use interviews to discuss each parent’s definition of the term “repetition.”

When I planned this study, my hope was that parents would expand their ideas about how learning occurs. Along these lines, I anticipated that they would reject the view that students learn math best through repetition, even if this belief was deeply ingrained in their views of mathematics. According to questionnaire data, this anticipated change did not happen. This failure, however, reflects a shortcoming in the manner in which I collected the data. What I have come to realize is that issues related to repetition in the teaching and learning of mathematics are much more complex than I understood prior to (and during) the study. Therefore, the data I have are far too simplistic to make an argument, one way or the other, about whether parents expanded their ideas around repetition. That said, I do present a discussion that revolves around two parents’ emerging views of repetition.

Based upon my data, Ms. Altaian is the only core parent who began to change her ideas about repetition. We talked about this a few times and she told me that participating in the study led her to conclude that standards-based curricula focus more upon creating opportunities for students to solve problems and develop number sense, than on memorizing math facts. She was beginning to wonder if repeating mathematics exercises was as important as she thought. Ms. Altman serves as the only example of a participant who changed her ideas around repetition, based upon questionnaire data.
I argue that, notwithstanding the data, Ms. Cutler changed her views about repetition as well. Ms. Cutler grew up outside the United States. She told me that she learned math through traditional methods, including quite a bit of repeated arithmetic. Throughout the study, Ms. Cutler lamented that the students needed “more practice.” During our conversations, I established that she was using the word “practice” to mean repetition of exercises. Interestingly, when it came to working with her son at home, she told me that she moved away from her prior approach of giving him extra pages of arithmetic. In addition, she began to find other ways to work with him, such as discussing mathematics in context during errands. Although Ms. Cutler continued to critique the curriculum’s lack of “practice,” she cut down on her use of repeated arithmetic at home. I believe this shows that, like Ms. Altman, Ms. Cutler began to value learning based upon thinking skills, not rote.

Although Ms. Altman and Ms. Cutler responded quite differently on their questionnaires, I believe that they came to similar conclusions. I argue that their ideas about what I have been calling “repetition” in the teaching and learning of mathematics were emerging and were starting to align more with constructivist approaches.

Role Changes

The expanded theory of change provides an explanation for how the intervention led parents to make changes at home. In order to develop the theory, I analyzed these changes, such as devoting time to discussing math and utilizing real world context, at the individual level. In the previous chapter, Cai’s (2003) work served as a lens through which we can examine what roles parents seemed to be assuming at home and whether or
not these roles evolved during the intervention. This analysis was done at the individual level. The following discussion examines the changes parents experienced collectively in order to understand their meanings and evaluate whether we can make some general conclusions about these individual level changes.

In Chapter 5, I argued that five parents changed the way they work with their children at home around mathematics. I also showed that four out of these five parents changed their roles; they began to work with their children in ways that Cai (2003) would call “indirect.” Based upon student performance, Cai concluded that indirect forms of assistance were more effective in helping their children with mathematics.

Cai’s (2003) two categories of assistance, direct and indirect, can be compared to traditional and constructivist teaching methods. Teachers utilizing constructivist methods guide students toward constructing their own mathematical knowledge. Thus, teachers assume an indirect role with their students. This contrasts with the traditional (direct) method of teachers providing information for students to absorb.

Based upon this analysis, the parents in my study began to relate to their children mathematically in ways that I argue are more consistent with constructivist methodologies. Therefore, to borrow terminology from Lehrer and Shumow (1997), the “construction zones” of home and school became more aligned. As discussed in the review of literature, Lehrer and Shumow have argued that this is necessary for students to succeed when it comes to standards-based mathematics.

These role changes have an important place within the theory presented above. As a result of experiencing new things in my classroom, participants changed the way
they work with their children at home. Perhaps what is most interesting about these changes is that they were more aligned with the teaching methods used in my classroom. Although this study was small and is not generalizable (in a statistical sense), this change is intriguing. As documented in the review of literature, there is often a separation between home and school math (Abreu & Cline, 2005 and Remillard & Jackson, 2006). I believe this division not only works against the reform, but also makes it hard for families to negotiate school math. Bringing parents into the classroom may be a key ingredient in not only helping them understand standards-based mathematics, but also showing them approaches they can use at home.

**Implications**

My key finding is that being present in the classroom benefited parents in three ways. They learned about the curriculum; some of the parents appreciate it more as a result. Many of the core parents' traditional beliefs about math teaching and learning changed, causing them to endorse standards-based beliefs. And they changed the way they work with their children at home, using methods more consistent with those used at school. I argued that, as parents experienced new things in the classroom, they began to question their previously held beliefs about math teaching and learning. They not only changed some of their beliefs, but they also changed the way they work at home with their children. These findings and the theory of change have implications for teachers, school districts, curriculum developers, and future research.
Find Ways to Involve Parents

As presented in the theory of change, participating in the intervention allowed parents to experience new things. This caused parents to change their actions at home. As I have argued, parents began to work with their children in ways that align better with the approaches used in school. This implies that parents should be involved in school mathematics. Teachers, school districts and curriculum writers can all work toward this goal.

**Teachers.** Teachers need to invite parents into their classrooms. Peggy Scott (2007) is a principal in a school striving to involve parents in the math classroom (see Chapter 2). The teachers in her school were reluctant to allow parents to attend math class, but found that they were pleasantly surprised by the way parents acted while in their classrooms. I was concerned about having parents in my classroom as well. And, similar to the teachers in Scott’s school, I was also very pleased with the results. Parents were helpful, enthusiastic and respectful. They embraced the experience and taught me many things. These examples lead to the question, why are we teachers so resistant to involving parents in their children’s schooling?

Peressini (1998) claims that this is due to the way parents are negatively portrayed in reform mathematics documents. He believes that these documents set the tone for educators to exclude parents. In my opinion, there are two ways that teachers can be encouraged to involve parents, through teacher education and continuing education. Preservice teachers should be required to take a course about family involvement in schools. Teachers can also be encouraged to embrace parents through inservice
programs. For example, Hamilton School District could have used me as a resource. They approved my intervention and then forgot about it. They might have asked me to run an inservice meeting around inviting parents to participate in math class. Or, school districts could present teachers with the task of brainstorming ways to get parents involved at home. Teachers could use their standards-based curricula to create projects or information sheets that would help parents become a more integral part of their children’s math learning.

**School districts.** School districts must set the tone for their teachers. If districts hope to continue using standards-based curricula, they must find ways to involve parents in their children’s math learning. At the time of this study, Hamilton School District held one math night per year during which parents were invited to learn about *Everyday Mathematics*. Parents who attended took part in hands-on activities that were similar to classroom lessons. This is a wonderful way to create new experiences for parents; however, once a year is simply not enough. The core parents in this study became better resources for their children after only a few visits to the classroom. I believe there would be similar results if school districts offered math nights throughout the year.

School districts could also encourage teachers to invite parents into math classrooms. As mentioned, inservice programs are one way through which this could be done. However, I believe it will take more than a few meetings to change the culture of home-to-school contact. Every year at Monroe, during American Education Week in November, parents are invited to come to their children’s classroom(s). Although this is an attempt to involve parents, I believe it has the opposite effect. Inviting parents into the
classrooms one day per year sends a message that they are not invited every other day. There should be an open door policy in our public schools. Based upon the findings of my study, I believe that teachers, parents and students would benefit from such an arrangement.

During my study, I was surprised to encounter parents who were available during math class, but who did not come to any visits. Although I do not know the reasons, I assume that they were reluctant to come to the classroom. My experience suggests that school districts should find ways for parents to be more involved at home. One parent suggested filming portions of math class and making them available on the district website. For example, these videos could show teachers and students demonstrating *Everyday Mathematics* algorithms or games. In Hamilton, there is a local television station that airs school district-related functions such as board meetings and assemblies. Perhaps there could be a “Math Hour” that aired exemplars of math lessons for parents and students to watch together. Students would enjoy seeing themselves on television and their parents would have an opportunity to experience the classroom without having to be there.

This idea coincides with the study by Lehrer and Shumow (1997) discussed in Chapter 2. The parents in this study watched videotapes depicting various elements of standards-based teaching methods. As a result, parents learned about such methods and endorsed their use.

**Curriculum writers.** Just as school districts can encourage teachers to make parents a priority and include them in their children’s learning, so too can those who
develop standards-based curricula. Gellert (2005) and Epstein and Jackson (2006) studied standards-based curricula and found that they did not have beneficial parent components. They concluded that parents are either discouraged from participating or are given materials to use that are not accessible. Those who develop curricula should find ways to involve parents more effectively.

Various parents in my study told me that they use the Student Reference Book at home with their children (Monroe makes it a priority to allow parents to keep this book at home). They have learned from this book and appreciated having it as a reference. However, this book is written for students and for use in the fourth grade classroom. There should be a version written specifically for parents to use at home. Above all, it is essential that resources for parents be accessible. Curriculum writers need to run focus groups in order to best involve a broad spectrum of parents.

**View Parents as Thinkers**

Parents have often been viewed as hindrances to the standards-based reform movement (Peressini, 1998). Educational researchers argue that continuing to regard parents in this manner will be detrimental to the success of this reform (Abreu & Cline, 2005; Graue & Smith, 1996; Lehrer & Shumow, 1997; Lubienski, 2004; Peressini, 1996; Remillard & Jackson, 2006; Shumow, 1998). It is important to think about parents in new ways when it comes to standards-based mathematics education.

During this study, I treated my students’ parents in a way that was very new for me as a teacher. I invited them to my classroom to experience lessons and be part of the action. When this began, I was unsure what would happen. Now that I have had time to
analyze my data and reflect, I argue that the most important thing the core parents did during this study was think. And, this thinking had a positive impact on them, on me, and on their children.

Through both journal questions and interviews, I asked parents to think about things such as the lessons, the curriculum and the teaching techniques. In my experience, parents are not often asked to reflect on such things. The core parents in my study responded enthusiastically and respectfully. They supported most of what they observed, but they also spoke their minds about elements of the curriculum or my teaching with which they disagreed. They spent time thinking about what they experienced and, as a result, they learned. Many learned about the standards-based curriculum and teaching methods. And, one parent learned quite a bit of math content. Based on these findings, I suggest that it is valuable to give parents the opportunity to think and frame them “as learners, or as intellectual beings” (Jackson & Ginsburg, 2008, p. 20).

The nature of classroom visits encouraged parents to think and learn in an individual manner. When I designed this study, I wanted parents to have the freedom to experience my classroom in personal ways. I encouraged parents to do whatever felt right for them. I did not assume that I would be teaching them, but rather that we would be sharing space and experiences. This is another way in which constructivism acted as a framework for the intervention. Parents were guided, but not directed. They constructed their own knowledge and each parent had a distinct learning experience.

The thinking that parents did during this study impacted my teaching in a way I had not anticipated. While in the classroom, parents experienced standards-based
teaching methods. They then thought about their effectiveness and shared these thoughts with me during our interviews. For instance, many advocated the use of slate drills. This reminded me of their value and encouraged me to use them more often. Parents also pushed me to think about my teaching in new ways. For example, during one lesson, I told the students that what they would be doing was “hard.” One parent reacted positively to this, expressing her view that I was giving students permission to struggle, but also to persevere. Another parent questioned my use of this word, saying that he wondered if kids would try their hardest if I suggested it was going to be difficult. Parent interviews reminded me of the conversations I had with peers as a student of education. Parents and I were thinking aloud together, and the interviews became wonderful outlets for reflecting on my classroom practice.

The thinking parents did during this study also had a positive impact on their children. As described in Chapter 5, the core parents became more successful resources at home. For example, Ms. Brown learned math content that she is now able to use to assist her son at home. I anticipated this type of thinking and learning, but did not consider the other ways in which parents would learn. As a result of observing students of varying levels in my classroom, Mr. Goodman learned about how an average fourth grader thinks and what he or she understands. He felt this taught him to relate better mathematically to his own sons. This parent has a very strong math background and was already a wonderful resource for his children. However, being present in the classroom had a positive effect on the way he worked with his children at home. This leads me to
believe that classroom visitation can be an important learning experience for many parents as they support their children in the area of mathematics.

As a result of this study, I envision parents and their roles in new ways. In my experience, rightly or wrongly, we educators usually focus on what parents can do to support us. I believe deeply in the importance of parents finding ways to assist their children’s teachers. One way that we can foster that support is to view parents as thinkers and learners. I found that the support I gave to the parents was reciprocated. That is what this intervention was all about and, in my opinion, some amazing things happened.

Researchers conducting studies in this area should also view parents as thinkers. The MAPPS project described in Chapter 2 is an example of research that focuses on the importance of viewing parents as learners. Jackson and Ginsburg’s (2008) study presents another example of the importance of viewing parents as thinkers and learners. They held math workshops for parents based upon the standards-based curriculum in their children’s school. Their main goal was to help parents assist their children. However, they found that parents were also interested in learning math and attending the workshops became an intellectual experience for them.

Additional Research in This Area

There are very few pieces of scholarly work that incorporate parents being present in standards-based mathematics classrooms. Anhalt, Allexsaht-Snider and Civil (2002) conducted a study in which parents participated in standards-based mathematics lessons. They concluded that being present in the classroom was beneficial for parents and their
understanding of standards-based teaching methods. The results of my intervention were similar and suggest that this type of participation is powerful for parents. Although both studies were small and my results are not generalizable, these findings imply a need for further research. Based upon my review of the literature, the current reform to math education will only survive if educators can find ways to deal with parent resistance and confusion. Direct parental involvement in the classroom has been shown to break down this resistance and clear up this confusion. To this end, future research should involve parent presence in standards-based classrooms.

My findings also suggest that future research in this area should not only study what happens in the classroom, but also what happens at home. Lehrer and Shumow (1997) conducted studies with parents and concluded that the “construction zones” of home and school should be better aligned. They believe that this will give the current math reform its best chance to succeed. My findings suggest that the core parents began to work with their children in ways that aligned with the approaches used in school. However, I did not formally study what happened in the families’ homes. Future research should examine how well school and home are aligned and how teachers and parents can work toward a closer match.

Implications for My Practice

Designing and implementing this intervention had a significant effect on my practice as an educator. While working at a public elementary school, I never felt encouraged to embrace parents and involve them in their children’s learning. Now that I have conducted research with parents, I am convinced that they are resources that we
educators take for granted. Although this intervention was focused upon standards-based mathematics, I believe that it could have been done with any subject I taught. I imagine parents coming into writing lessons and journaling along with students or visiting during science and conducting experiments with them. Whether I return to the classroom, oversee teachers, or teach students of education, I plan on ensuring that parents are a part of the learning environment in new ways.

Conducting this research opened my eyes to the way in which great public school teachers think about parents. I worked with wonderful teachers who had excellent work ethics and took pride in their work with students. However, these same colleagues, upon hearing about my intervention, congratulated me for being so brave as to invite parents into my classroom willingly. They were, in other words, resistant to involving parents in their own classrooms. This resistance must change. I have seen the benefit of direct parental involvement in the classroom. The visitation I encourage for parents has to reach beyond my classroom. Perhaps I can convince my peers to give it a try. In fact, I have often wondered if more parents would have participated in my study if each of the fourth grade teachers had been involved.
APPENDIX A
Initial Parent Questionnaire

Dear Parents,

This questionnaire will help me with my doctoral research. I will also be inviting you to join us in math class on specific days throughout the year. My goal is to positively enhance your experience with fourth grade *Everyday Mathematics*. However, even if you are unable to visit the classroom, I would still really appreciate your time with this questionnaire. Rest assured that I am the only one who will see this and that pseudonyms will be used in all written materials. Please be as specific as possible. Thank you so much for your time and participation.

Sincerely,
Ms. Blume

Name ________________ My fourth grader’s name ________________

Background questions:
1. Other than your current fourth grader, please list your other children that have attended Monroe and the grades they attended here. ________________________________

2. The following chart lists different things that parents do when helping their children with math at home. Use checks to indicate whether and how often you do the following things. *Always* means about 5 times per week. *Usually* would be 3-4 times per week and *sometimes* is 1-2 times per week.

<table>
<thead>
<tr>
<th>Things parents do when helping their children with math at home</th>
<th>Never</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the homework in some way (e.g., to make things simpler or more challenging for your child)</td>
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<td>Contact the teacher when you have a question</td>
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or concern

<table>
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<tr>
<th>Introduce math activities not related to school work (e.g., counting change, mathematical games)</th>
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<tr>
<td>Introduce math activities related to school work (e.g., flash cards, computer games, work books)</td>
</tr>
<tr>
<td>Encourage your child to check his/her work</td>
</tr>
</tbody>
</table>

3. In what ways (if any) would you like to participate more in your child(ren)'s math learning? ________________________________________________

4. If you work outside of the home, what is your job? ____________________________

Do you feel that you use math at your job or at home? If so, how? ____________________________

Questions about math at Monroe:

5. The way math is taught at Monroe is different than the way I learned math in elementary school. (Circle one.)

   - Strongly agree
   - Agree
   - Disagree
   - Strongly disagree

   If you circled "strongly agree" or "agree," in what ways are they different?

   ________________________________________________

   If you circled "disagree" or "strongly disagree," in what ways are they the same?

   ________________________________________________

6. How much do you feel you know about the *Everyday Mathematics* curriculum used at Monroe? (Circle one.)

   - Very little
   - A moderate amount
   - A lot
7. How have you learned about the curriculum (such as using the Student Reference Book, attending workshops, talking to teachers)?

8. I like the way math is presented by the Everyday Math curriculum. (Circle one.)
   Strongly agree  Agree  Disagree  Strongly disagree
   Please explain briefly.

Questions about math teaching and learning:

9. The following chart lists statements about teaching and learning mathematics. Please use a check to indicate your opinion of each.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
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<tr>
<td>Discussion amongst students in the math classroom impedes learning.</td>
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<tr>
<td>The language and symbols of Everyday Math are difficult to understand.</td>
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<tr>
<td>It is more important for students to have the multiplication facts memorized than be able to solve problems.</td>
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<td>Fourth graders should work frequently with math materials (e.g., chips, blocks, shaped pieces).</td>
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<td>It is important for students to learn more than one way to solve math problems.</td>
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10. Additional comments related to math teaching and learning: ______________________

___________________________________________

___________________________________________

___________________________________________
APPENDIX B
Parent Journal

Name ____________________  My child's name ____________________

Directions: Please answer the following questions and leave this for Ms. Blume. Be as specific as possible. THANK YOU!

1. What stood out for you during this visit to the classroom? ____________________
   ____________________
   ____________________
   ____________________

2. Name a few things you did while you were here.
   1. ____________________
   2. ____________________
   3. ____________________

3. Name a few things you observed students doing or saying.
   1. ____________________
   2. ____________________
   3. ____________________

4. What do you think were the most important math skills taught during the lesson? ________
   ____________________
   ____________________
   ____________________

5. If there was anything you could change about the lesson, what would it be? ________
   ____________________
   ____________________
   ____________________

6. What surprised you about today's lesson? ____________________
   ____________________
   ____________________
   ____________________
APPENDIX C
End-of-Year Questionnaire

Dear Parents,

As I mentioned in my email to you, this questionnaire is similar to the one you filled out in the beginning of the year (but much shorter). Please fill it out when you get a chance and send it to me (in the envelope I provided). I will contact you once I have gotten it so that we can set up an exit interview. THANK YOU SO MUCH!

Sincerely,
Debbie Blume

Name ______________________

The following chart lists different things that parents do when helping their children with math at home. Use checks to indicate whether and how often you did the following things this year. Always means about 5 times per week. Usually would be 3-4 times per week and sometimes is 1-2 times per week.

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<td>Most math problems fourth graders are given should use real world contexts (e.g., money, cooking).</td>
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<td>Discussion amongst students in the math classroom impedes learning.</td>
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<td>The language and symbols of Everyday Math are difficult to understand.</td>
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<td>It is <strong>more important</strong> for students to have the multiplication facts memorized than be able to solve problems.</td>
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<td>Fourth graders should work frequently with math materials (e.g., chips, blocks, shaped pieces).</td>
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<td>It is important for students to learn more than one way to solve math problems.</td>
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APPENDIX D
Histograms (for use with Chapter 4)

Study for a test with your child

Encourage your child to check his/her work
Change the homework in some way

Encourage your child to solve the homework problems in a different way
Introduce math activities not related to school work

Introduce math activities related to school work
Works Cited


