PARENTAL INVOLVEMENT AND MIDDLE GRADES STUDENTS' MATHEMATICS ACHIEVEMENT

by

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ABSTRACT

Parents of seventh grade students in an urban Georgia middle school that has a magnet component were surveyed in Spring, 2008. Aspects of their involvement in their children's education in general, and specifically in their children's mathematics learning were examined. Findings show that the most common type of parental involvement in homework in general was rule setting about homework, while the most popular form of parental involvement in mathematics homework was checking for children's understanding. Also, parents reported that they tutored, or assisted their children with mathematics homework significantly less often than they did with homework in general. Parents' beliefs and attitudes towards mathematics, their expectations for their children's mathematics education, and their self-efficacy for helping their children succeed in mathematics, were also examined. The results showed that while parents assigned low levels of importance to mathematics, they had high expectations for their children's performance in mathematics. However, their perception of their self-efficacy for helping their seventh grade children with mathematics was not very strong. Interestingly, parental involvement in mathematics was shown to have a significant negative relationship with mathematics achievement.

INDEX WORDS: Parental involvement, middle grades, mathematics achievement, mathematics homework, parents' beliefs, and parents' self-efficacy

PARENTAL INVOLVEMENT AND MIDDLE GRADES MATHEMATICS EDUCATION

by

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DEDICATION

For my husband Robbie and daughter Brittany who suffered the loss of quality family time with me during my pursuance of this degree. Brittany, the biggest sacrifice I made in pursuing this degree was not being able to spend more time with you doing more “fun” things. Robbie thanks for understanding when I am unable to give you much attention when you come home from work. Thank you both for your patience and support.

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CHAPTER 1

INTRODUCTION AND RATIONALE

Mathematics concepts can be challenging for many students, particularly for middle grades students. Teachers, parents and legislators have concerns about the mathematics achievement of middle grades students as they struggle to reach the national and state performance standards set by legislators (U.S. Department of Education, 2007), and mathematics reform advocates (National Council for Teachers of Mathematics, 2000). In response to mandates of the No Child Left Behind Act (2001), Georgia has reconstructed its mathematics performance standards (Georgia Department of Education, 2007) to reflect a more rigorous curriculum that has left teachers in a quandary as to how to fill existing gaps in students' mathematics knowledge in order to improve their mathematics achievement. While the No Child Left Behind Act (NCLB) has propelled teachers to find more effective instructional strategies and adopt more aggressive pedagogical approaches, it has also generated an interest in looking at other factors that might increase mathematics achievement. One of the NCLB Act's mandates for increasing students' performance in mathematics is to increase parental involvement.

In an effort to better understand parental involvement in children's education at all levels, much research has been undertaken in recent years to examine the various aspects of parental involvement and their relationships to academic achievement. This has yielded positive results in most instances (Henderson & Mapp, 2002). However, at the middle grades (grades 4-8) level, few studies about the effects of parental involvement on mathematics achievement have been conducted, and none have focused specifically on the parental involvement activities that affect mathematics learning. Additional research might help us to understand how parental

involvement practices in adolescents' mathematics learning could help to bridge the achievement gaps in mathematics at the middle grades level.

Teachers of mathematics are placed in classrooms where they are meeting the challenge of teaching mathematics to students of various cultural backgrounds, having a wide range of skills and abilities. Even veteran mathematics teachers sometimes exhaust all their resources and find themselves wondering what more they could do to improve students' mathematics achievement. Middle grades teachers of mathematics have no simpler task than teachers at other levels. In fact, middle grades teachers grapple with the frequent frustrations and confusions about mathematics learning that their students demonstrate inside and outside of the classroom.

Research shows that academic performance of young adolescents' declines during the middle grades. In fact, Haycock's and Ames' (2000) study examined earlier reports from the National Assessment of Educational Progress (NAEP) data from the U.S. Department of Education, as well as the Third International Mathematics and Science Studies (TIMSS,1999), that reported academic performance in the middle grades nationally and internationally. The studies show that performance in the U.S. had actually declined in mathematics and science, and had been stagnant in reading in the years between 1986 and 1996; and that the United States performance in mathematics ranked in the bottom 52% among nations (TIMSS 1999). Haycock and Ames (2000) expressed concern that the studies, in their reviews of the literature, did not shed light on the reasons for the low performances. The NAEP 2005 report indicated that there was an improvement of 17% at or above the basic proficiency level in mathematics scores in middle grades between 1990 and 2005. However, there has been a national concern that students' performance in mathematics is still below expectations. One explanation could be, that mathematics reform and new mathematics standards make it is no longer sufficient to just be

proficient in basic skill mathematics. Mathematics standards have become more rigorous, and students are expected to develop a deep conceptual understanding of the content areas that they are expected to cover (see the Georgia Department of Education, Mathematics Standards).

The National Assessment of Educational Progress 2005 (NAEP, 2005), showed that about three fourths of the U.S. eighth graders are performing below standard in mathematics, and that improvement is slow. In Georgia, performance between the fourth and eighth grades dropped seven points between 2003 and 2005. Overall, there was only a slight increase at the national level. This is cause for concern in Georgia as well as in other states. School districts have taken on the challenge to increase mathematics performance levels.

The National Council for Teachers of Mathematics (2000) supports the development of standards for the mathematics curriculum. Their purpose is to raise the level of student performance in mathematics in the United States. This and other mathematics reform efforts are spurred by the deficiency in students' mathematics performance countrywide compared to other nations.

Out of the general need to increase mathematics achievement in the United States—particularly at the middle grades level, comes the need to study and understand various ways and means to increase mathematics learning. A small body of research has found that parental involvement significantly contributed to mathematics achievement (e.g., Phillips, 1992; Yan & Lin, 2005). Van den Broeck, Opdenakker and Van Damme (2005) in their study, using the Flemish Third International Mathematics and Science Study (TIMSS) data (1999), found that 57 percent of the variance in mathematics scores are situated at the student level (e.g., intelligence, ability, attitude toward mathematics, educational level of parents, etc.). Twenty nine percent was found to be at the class level, and fourteen percent at the school level. If 57 percent

of the variance in mathematics scores is at the student level, and if parents play a significant role in influencing students' achievement through their actions, expectations, attitudes, and beliefs, it follows that parental influence could be a significant contributor to that 57 percent. Interestingly, only 14 percent of the variance was attributed to the school level. The 29 other percent variance attributed to the class level would include factors such as teacher effects, which incorporates instructional strategies, the curriculum, teacher influence, and classroom climate. The TIMSS research and other studies demonstrate the need for parental involvement research when it comes to mathematics achievement in the middle grades.

In an effort to increase mathematics performance, schools have adopted a variety of programs, initiatives, and strategies. One of the strategies derived from studies aimed at increasing mathematics achievement through research-supported recommendations, is to increase parental involvement. However, increased parental involvement does not necessarily mean effective parental involvement. The parental involvement strategies must show specifically how particular aspects increase achievement in specific content areas. It should be clear whether there is a one-size-fits-all parental involvement strategy for all academic achievement, or whether there are specific parent involvement strategies by specific groups, that must be applied to achieve specific outcomes such as mathematics achievement. More research that investigates parents' perspectives of their roles in middle school students' mathematics learning is needed.

Research findings suggest that mathematics success for middle grades students could be enhanced by specific types of parental involvement (Sheldon & Epstein, 2005). However, specific aspects of those types of parental involvement in relation to middle grades mathematics achievement have not been investigated. Also, research suggests that parents may become involved in their children's education in different ways, and for different reasons (Hoover-

Dempsey & Sandler, 1997). Other studies indicate that some of those reasons are based on their socioeconomic status, sociocultural issues, and parents' educational background (Portes, Zady, & Dunham, 1988; Schiller, Khmelkov, & Wang, 2002). These factors may influence parents' beliefs, attitudes, and expectations about their children's education (Ibanez, Kuperminc, Jurkovic, & Perilla, 2004; Pearce, 2006), as well as their perceptions of their role in their children's education.

Hoover-Dempsey and Sandler (1995) have identified three psychological constructs that explain why and how parents become involved in their children's education; their perception of their role, their sense of efficacy about their ability to help, and invitations from the child and school to become involved. Research suggests that because of the complexity of middle grades mathematics content, parents' sense of efficacy may limit their involvement in their children's mathematics learning, perhaps more than in other subject areas. In addition, sociocultural issues, when applied to the issue of the reasons parents become involved in their children's education, suggest that parents' feelings about mathematics, and their connection with the school could serve as a deterrent or booster for parental involvement in supporting mathematics learning.

Several studies focused on factors that influence middle grades students' academic achievement such students' characteristics, teacher quality, instructional strategies, and school climate. Another branch of research focused on parental involvement as it relates to academic achievement (Henderson & Mapp, 2002). Although a few studies have established that parental involvement is associated with adolescents' academic achievement (Catsambis, 1998; Jeynes, 2005; Sheldon & Epstein, 2005; Spera, 2006), most studies tend to focus on parental involvement at the elementary level (e.g., Barnard, 2004; House, 2006; Lee, 2006). Some studies on parental involvement were more focused, as they examined the effects of specific aspects of

parental involvement in children's mathematics education (e.g., homework, expectations, home environment, motivation, attitude, socioeconomic status, race/ethnicity, and parents' educational background) at the secondary school level (e.g., Balli et al., 1998; Crane, 1996; Der-Karabetian, 2004). These studies focused on various parental involvement practices and how they affect academic achievement. However, inconsistencies in studies in terms of the definition of *parental involvement* have led to varying and sometimes conflicting results. This inconsistency in some studies is partially caused by a failure to state more precisely what the variables that are being examined represent, and particularly by a failure to select the most appropriate measures.

From her synthesis of research, Epstein (1992, 1995) brought relative consistency about the definition of parental involvement with the introduction of her typology of six dimensions of parental involvement now commonly used in the field of educational research. Her typology includes *parenting* that involves general parenting responsibilities, and *learning at home* such as assistance with/checking homework, providing educational resources, and monitoring children's time and activities. *Home-to-school communicating* includes parent-initiated and school-initiated contacts regarding students' academic performance. Parental *involvement at school* includes volunteering at school, meeting with the teachers, and attending parent-teacher meetings. *Decision making* as a function of parental involvement is also included in Epstein's typology, to include parents' participation in decision-making organizations and initiatives. *School-community collaboration* means involvement in school-community-based organizations.

Most studies on parental involvement in general fall under topics involving learning at home (including parenting), school involvement, and communicating; while studies on parental involvement in mathematics achievement mostly focus on parents' expectations, attitudes, beliefs, and perceptions. Very little research has been completed on the relationships between

specific aspects of parental involvement in mathematics and middle grades students' mathematics achievement.

I will examine the influence of factors that are subcategories of Epstein's types of parental involvement on middle grades students' mathematics achievement. I specifically want to examine the influence of parental involvement in middle grades students' education at home. Variables will include involvement in such areas as supervision; homework; parent-child discussions; parents' attitudes and beliefs; and expectations for their children's mathematics performance. Parents' communication with the school has also been established as important when it comes to student performance (Epstein, 1995). Therefore, parents' home-school communication as it relates to what parents do at home will be included in the analyses. I will not examine parental participation at school (e.g., volunteering and attending functions) because of the need to focus on factors that are most often associated with mathematics achievement, and because it has been shown that this factor has a negligible effect on mathematics achievement (Sui-Chu & Willms, 1996; Van den Broeck, Opdenakker, & Van Damme, 2005). Involvement in terms of school-community collaboration will not be addressed in this study for similar reasons.

Purpose of the Study

Mathematics performance in the middle grades has not been increasing comparably with other subject areas (NAEP Report, 2005). Simultaneously, parental involvement has been shown to decline at the middle level (Haycock & Ames, 2000) as the mathematics curriculum increases in rigor, as more complex concepts are being introduced (Georgia Department of Education, 2007). More importantly, research shows that parental involvement has a significant relationship with students' academic achievement in general (Henderson & Mapp, 2002).

Since it has been established that parental involvement is associated with students' achievement, effective parental involvement could be a driving force to help raise the performance standards in mathematics sought by the NCTM, State Departments of Education, and other agencies or organizations that promote this ideal, particularly in the middle grades. In order to accomplish improved mathematics achievement, all factors that could support such efforts must be investigated and made clear. It is therefore important to understand what factors denote effective parental involvement in children's mathematics education.

This study is expected to add significant knowledge to the literature on parental involvement in middle grades students' mathematics achievement, by investigating aspects of parental involvement that are more significantly associated with mathematics success. It is hoped that this study will shed light on essential aspects of parental involvement in middle grade students' mathematics achievement that have been under-investigated. The purpose of the study is to understand which aspects of parental involvement under investigation show the greatest significance in their relationship to middle grades students' mathematics success. In this investigation, attention will be paid to things that parents do at home to help improve their children's mathematics performance. Broad concepts investigated will encompass what parents do at home to enhance children's learning, their involvement with children's mathematics homework, their beliefs and attitude towards mathematics, their expectations for their children's performance in mathematics, as well as their sense of efficacy (self-efficacy) for helping their children become successful in mathematics. Dimensions of these factors will be used to understand their effects on middle grade students' mathematics achievement.

Expectations are that this study will make a significant contribution to the existing body of research on parental involvement in children's mathematics education. It is hoped to bring

clarity to degree to which parents are involved in different aspects of their children's mathematics education, and whether these aspects have a relationship with mathematics achievement. Finally, it is hoped that the results of the study will help parents to become more effectively involved in their children's mathematics learning, so that their children may become more successful in mathematics.

Research Questions

1. What is the extent of parental involvement in middle school students' homework, especially in mathematics?

    1a) What percentage of parents is involved in children's homework, in general?

    1b) What percentage of parents is involved specifically in children's mathematics homework?

2. What is the relationship between parental involvement in homework and children's achievement, especially in mathematics?

    2a) What is the relationship between parental involvement in general and children's general achievement?

    2b) What is the relationship between parental involvement in general and children's mathematics achievement?

    2c) What is the relationship between parental involvement in mathematics and children's mathematics achievement?

3. What are middle school parents' beliefs, attitudes, and expectations about mathematics?

    3a) What are parents' beliefs and attitudes about the importance of mathematics?

    3b) What are parents' expectations about their children's performance in mathematics?

(3c) What is parents' perception about their self-efficacy for middle school mathematics?

4. What are the relationships between parents' beliefs, attitudes, and expectations about mathematics and their involvement in their children's mathematics homework?

4a) What is the relationship between parents' beliefs and attitudes about the importance of mathematics, and their involvement in mathematics homework?

4b) What is the relationship between parents' expectations about their children's performance in mathematics, and their involvement in mathematics homework?

4c) What is the relationship between parents' self-efficacy in relation to middle school mathematics, and their involvement in mathematics homework?

Working Definitions

In this section, I will define the terms that will be used throughout this study in terms of their applicability to the study. In this study, the definition of *parent* is the natural or adoptive parent, legal guardian, or person having legal custody of a child. This definition includes grandparents, or other family members who are given permission by the natural, adoptive, or legal parents to act on their behalf. The definition of parental involvement as it relates to parents' participation in activities that specifically relate to, or affect children's formal schooling at the middle grades level will be adapted from Epstein's (1995) typology of six types of parental involvement.

General parental involvement according to Epstein (1995) includes *parenting* activities such as supervising and monitoring behaviors and activities appropriate for the children; *school-to-home communication* such as parent- or school-initiated contacts; and other *home involvement*

activities which include the provision of a home structure that is conducive to learning, helping with and monitoring homework, providing additional opportunities to learn, and includes parent-child discussions. Parents' educational expectations for their children will also be examined because there are clear arguments in the literature, that these expectations have predictive values on achievement in general and on mathematics achievement. Epstein's other three types of parental involvement: *school involvement*, involvement in *decision-making*, and *school-community collaboration* will not be a focus of this study because the intended focus is on parents' involvement activities that are more directly related to mathematics.

Mathematics achievement will be defined in this study as: (a) mathematics scores on the Criterion Referenced Competency Test 2007 (CRCT) which is the test for mathematics performance standards in grades two through eight in the State of Georgia, and (b) math report card grades for Fall semester 2007. General academic achievement will mean students' overall grade point averages. The rationale for using these scores will be discussed in Chapter 3 of this study.

Limitations of the Study

The targeted sample consisted of parents of approximately 298 students in the seventh grade at a middle school in metro Atlanta, serving a majority of African American students. It includes three seventh grade teams consisting of six classes of high achievers (placed according to scores on the CRCT standardized tests in earlier grades), and six classes of students with varying abilities. The composition of participants was later adjusted (see Chapters 3 and 4). A response rate of about 50-60% was expected; the actual response rate was 62%. A larger sample size from a number of schools would have provided greater assurance that the results are more likely to reflect the true population. However, the size was still large enough so that the

significance and reliability of the study was not significantly compromised. Also, as with all other studies of this nature, the responses elicited by the questionnaires reflected respondents' perceptions, rather than recorded data of parental involvement, and may not have always represented true information. In addition, in studies that use correlation analyses, it is unclear whether high achievement motivates parental involvement, or whether parental involvement leads to increased student achievement—a matter of which comes first. It may be necessary to use longitudinal data to more precisely evaluate the effects of parental involvement.

CHAPTER 2

REVIEW OF THE LITERATURE

Parental involvement has been found by several studies to be related to children's academic achievement (Fan & Chen, 2001; Sheldon & Epstein, 2005). Because of the new efforts to increase academic achievement in the United States, there have been several studies conducted to understand the effects of parental involvement on academic achievement in specific subject areas, with different demographic groups, and at the various grade levels.

Several types and aspects of parental involvement have been studied in order to understand its influence. However, the definitions of parental involvement have varied from study to study, and different measures have been used to assess its effects. Therefore, many questions have been left unanswered regarding the appropriate application of specific aspects of parental involvement at specific age or grade levels, and for specific subject areas. In this review, when I use the term *parental involvement*, I am referring to what parents or caretakers of school-aged children do to enhance children's academic learning during formal schooling. By *middle grades students* I mean children in grades four through eight who are attending formal schools, and *measures of achievement* will include report card grades, grade-point averages, and/or standardized test scores.

The urgent need to increase mathematics and science achievement, and the lack of research done on specific aspects of parental involvement with specific reference to middle grades mathematics achievement, have made studies such as the one I propose, of great importance to the quest for raising mathematics success at the middle grades level.

In the following sections in this chapter, I will review the literature on the effects of parental involvement on students' academic achievement and on mathematics achievement. The

types of parental involvement chosen for greater focus in this investigation will include parenting and parental involvement at home, including home-school communication. These types of parental involvement noted as a part of Epstein's (2001a) typology (discussed in the sections below) has often been referenced in many research studies as the standard types of parental involvement. Aspects of these types have been linked with mathematics achievement by various studies (Balli, Demo & Wedman, 1998; Ma, 1999). Although not a focus of the study, I will also examine the literature on middle grades students' achievement, in order to understand how middle grades students' characteristics might be related to aspects of parental involvement that would be most effective for the mathematics achievement of middle grades students. This information may help to explain findings for aspects of parental involvement that are significant for mathematics students in the middle grades. I hope that upon completion of this investigation, I will have made a significant contribution to the literature by more specifically identifying aspects of parental involvement that have the greatest potential for increasing middle grades students' mathematics achievement.

Parental Involvement

Some parents leave their children's education entirely to the school, some may offer assistance only when the child asks for it, and some take equal responsibility with schools for their children's learning. The type of parental involvement in children's education varies from parent to parent, family to family, and from culture to culture (Pearce, 2006). Some of these reasons for variations in parental involvement have been attributed to cultural differences (Jeynes, 2003); socioeconomic status (Muller, 1995); parents' educational background (Lee & Bowen, 2006); home environment—such as degree of support for school and family structure (Christenson, Rounds, & Gorney, 1992; Crane, 1996); as well as parents' attitudes, beliefs, and

their goals and expectations for their children (Hoover-Dempsey & Sandler, 1995; Keith & Keith, 1993).

To adequately assess the effects of parental involvement, it is important to understand how the term parental involvement has been defined in the literature. Parental involvement has been defined by studies in a number of ways that range from volunteering at the child's school to rigid monitoring of homework, and engagement with teachers. For example, definitions of parental involvement have included parental educational aspirations (Aldous, 2006; Trivette & Anderson, 1995) and expectations (Goldenberg, Gallimore, Reese, & Garnier, 2001; Phillips, 1992), parental involvement in school (Desimone, 1999; Shumow & Miller, 2001), parent-child communication (Trivette & Anderson, 1995), parental involvement at home (Desimone, 1999; Shumow & Miller, 2001), and supportive home structure/environment (Crane, 1996; Muller, 1995; Tsui, 2005). Although these are not the specific types of parental involvement identified by Epstein's (1995) typology (discussed below), they are mainly dimensions that would be classified under one of the categories of her typology. For example, parents' actions and attitudes towards education that are demonstrated to children at home relay parents' educational expectations and aspirations for their children's academic performance. Therefore, parents' actions and attitudes are appropriate for placement in Epstein's typology under "parental involvement at home." Parent-child communication and home structure may also be considered aspects of parental involvement at home.

Epstein (1987) first identified four types of parental involvement: (a) basic obligations, (b) communication with school, (c) parents' involvement at school, and (d) parents' involvement in learning activities at home. Epstein (1995) later expanded that typology from four to six levels of school-related opportunities for parents to be involved in children's learning. These levels

include: (a) assisting parents to establish a supportive home academic environment, (b) communicating with families, (c) providing volunteer opportunities for parents, (d) supporting home-based learning, (e) involving parents in school decision making, and (f) maintaining school-community collaboration. Many studies have referenced Epstein's (1995, 2001) typology for parental involvement. For many researchers, Epstein's useful typology has become the standard definition of the term parental involvement, bringing some stability to the way the term parental involvement has been conceptualized in studies. For example, Catsambis' (1998) study, that included middle school families, defined parental involvement using Epstein's framework of six types of school-related opportunities for parents.

Using measures of success in secondary schools, Catsambis (1998) used National Educational Longitudinal Study of 1988 (NELS:88) data to expand the knowledge of different parental practices in secondary education, as well as their effects on the academic success of high school seniors. She compared and contrasted parental involvement practices in the middle grades with those of high school seniors. Catsambis' interpretations of types of parental involvement in the eighth grade are based on Epstein's typologies. She explains that parental involvement in the eighth grade includes: (a) expressing academic expectations and supervising and monitoring time and behavior; (b) communicating with the school through parent-initiated contacts about academic performance as well as behavior; (c) supporting the school by volunteering and assisting with fundraising; (d) supporting children's learning at home by helping with academic lessons outside of school and/or providing enrichment activities such as music or dance lessons, and discussing school and plans for the future; (e) participating in decision-making by taking part in parent organizations; and (f) collaborating with the community using community learning

resources such as museum visits, and participating with community groups such as scouts and sports.

Catsambis (1998) found that middle grades parents are mostly involved in the daily supervision of their children's lives in terms of rule-setting and monitoring of their educational activities at home, and that for these aspects of involvement they get little assistance from schools. These activities may be viewed as home involvement under both Catsambis' and Epstein's (1995) typologies, and could also be aligned with Hoover-Dempsey's and Sandler's (1995; 1997) notion that parents' perception of their role in their children's education may influence how they become involved. If middle grades parents see their role as the monitoring of their children's activities at home rather than at school, they may be inclined to participate more in their children's education at home. If parents see their primary role as monitoring rather than tutoring or assisting directly with homework, this could influence their practices.

Parental Involvement and Achievement

Keith and Keith (1993) completed a study using NELS:88 data to understand the influence of parental involvement on eighth-grade student-achievement after controlling for relevant background variables (ethnicity, family background characteristics, and previous achievement). They examined definitions of parental involvement in the literature and consolidated them to determine that middle school parental involvement included (a) parents' academic aspirations and expectations for their children, (b) parents' participation in school activities and programs, (c) home structure that supports learning, and (d) communication between parents and children about school. The NELS:88 study surveyed a nationally representative sample of eighth grade students, their parent and their teachers, to collect substantial data for a wide range of issues connected to students' learning from the eighth grade

through college. Keith and Keith (1993) analyzed the data pertinent to parental involvement in the areas mentioned above using latent variable structural equation analyses (LISREL). This method of analysis assumes that one variable is linearly related to one or more indicators. It confirms simultaneous factor and path analyses, and helps to reduce the unreliability and invalidity of resulting factors. They found that parental involvement was associated with achievement in all academic areas, and that the amount of homework completed increased for students whose parents are more involved. Although this study accomplished its intended purpose (to understand the influence of parental involvement on middle schools' students' learning), the findings are general, since the effects of specific activities or concepts related to each aspect of parental involvement such as specific homework related activities were not reported.

Fan and Chen (2001) completed a meta-analysis to synthesize the quantitative studies on the relationship of parental involvement with students' academic achievement for all grade levels. After examining over eighty studies, several indicator-variables for parental effects on achievement were identified. Broadly, they were parent-child communication, home supervision, educational aspirations for children, and school contact and participation. The outcome variables included overall grades (grade point average); and mathematics, reading, science, and social studies grades. They found that parental aspirations and expectations had the strongest influence on academic achievement, and that home supervision had the weakest influence across ethnic groups. Fan and Chen found that when global measures such as overall GPAs were used rather than subject specific indicators such as math grades, the relationship between parental involvement and achievement was greater. In this case, global measurement is based on an average computation of all content areas where low scores are compensated for by high scores. A

student may perform at a higher level in one subject but not in the other. Therefore, the differences in results in these studies may be because when students' performances are assessed in specific subject areas, there may be a different outcome than when students' performances are assessed using global GPA. Fan's and Chen's (2001) findings suggest that researchers should use both global measures such as grade point averages (GPAs), and subject specific measures such as math scores in the same study. The implication of Fan's and Chen's finding is that the relationship between parental involvement and achievement may vary when different measures of achievement are used in studies, as well as when subject specific measures used.

Jeynes' (2003) meta-analysis on the effects of parental involvement on minority children's academic achievement revealed that there is a greater relationship between parental involvement and achievement when grades and other teacher-assigned ratings are used, rather than when standardized test scores are used. He offers the explanation that this occurs because parental involvement tends to focus on classroom-based assignments rather than preparing for standardized testing. He also suggested that teachers might be positively influenced by parental involvement, in that it reflects cooperation and interest on the part of parents. However, no evidence was provided to support this idea. The combined findings of Fan and Chen (2001) and Jeynes (2003) suggest that parental involvement in general shows a greater relationship with academic achievement in general (GPA) than with specific subject grades or subject-specific standardized test scores.

Research that shows the relationship of parental involvement to achievement when outcomes are measured by specific subject areas is important, and may shed some light on the appropriateness of some aspects of parental involvement for particular subject areas being

investigated. It is also important to note in research reports whether these findings are true for all demographic groups and grade levels.

Carter's (2002) annotated bibliography encompassed a decade of research on the impact of parent/family involvement on student outcomes. Seventy research studies were grouped into three related areas; school-based programs, family behaviors, and studies that analyze parental involvement research. An examination of the findings shows consistency with existing research in that:

1. Parental involvement positively influences student outcomes at the elementary, middle, and secondary school levels.

2. Student outcomes vary by culture, ethnicity, and socioeconomic background.

3. Parental involvement at home has a more significant impact on academic achievement than involvement at school.

4. Adolescents need more independence than younger children, yet their need for caring guidance and support from home, school, and community is strong.

5. Schools must provide parental involvement programs to fit the individual needs of their students, parents, and community.

6. Families need guidance and assistance to effectively help their children with homework.

7. Knowledge of family practices is valuable when planning parental involvement programs.

8. Positive outcomes have been documented in mathematics and literacy when children's parents are involved in their education.

9. Families, schools, and communities working together provide the most promising opportunities for student achievement.

Carter's (2002) review includes recommendations from studies, articles, reports, and books about the effects of parental involvement. However, since not all of these sources are empirical in nature, of the twelve findings, those that are not empirical cannot be used as conclusive evidence. However, each of the findings listed here has been supported by at least one empirical study cited in this chapter, and therefore, on that premise, could be considered as having empirical strength.

In the following paragraphs, I will discuss selected studies highlighted in Henderson's and Mapp's (2002) review of research conducted to understand the impact of school, family, and community on student achievement. I chose to discuss this review in some detail because of its relevance to my study on parental involvement and academic achievement, and because of the volume of literature that was reviewed.

Henderson and Mapp (2002) examined over 51 experimental, quasi-experimental, correlational, and qualitative studies having sound methodologies. They examined one of nine common characteristics of high performing schools identified by the Office of the Superintendent of Instruction in Washington, D.C. in their review of 20 studies that examined the characteristics of high-performing schools. The characteristics identified were: a clear and shared focus, high standards and expectations, effective school leadership, high levels of collaboration and communication, standards-based curriculum and instruction, monitoring teaching and learning, professional development, a supportive learning environment, and high levels of parent and community involvement. Their review focused on research that deals with "high levels of parent and community involvement." Literature published since 1995 was

selected, as well as some seminal pieces on the process and impact of school, family, and community connections.

According to Henderson and Mapp (2002), the limitations of the literature examined were: there was insufficient long-term research for this work, some of the studies had small samples, some had self-reports rather than independent verification, and some had mixed, ambiguous, or incomplete findings and conclusions. However, the findings of research reviewed provided a good basis for improving policies and practices for schools. Henderson's and Mapp's findings on issues related to parental involvement suggest that programs that engage families in supporting their children's learning at home lead to higher achievement.

Some studies in Henderson's and Mapp's (2002) review used a social capital framework to understand parental involvement in terms of its role in increasing partnerships with community, parents, and school (Lareau & Horvat, 1999). However, social capital as it influences parental involvement may vary for different ethnic groups. In a separate study, Hong and Ho (2005) wanted to understand the effects of parental involvement on achievement of different ethnic groups. They, however, examined the direct and indirect longitudinal effects across four ethnic groups through second-order latent growth modeling (captures measurement errors caused by changes over time), while considering mediating variables (variables that are influenced by independent variable and in turn predict dependent variable). The mediating variables, students' educational aspirations, and students' *locus of control* (the ability to regulate or direct themselves to achieve goals), and students' self-concept were examined. Students' aspirations for academic success, their locus of control, and their increased self-concept are considered mediating/indirect because they are fostered when the importance of education is conveyed to students by their own parents' involvement in their education.

In Henderson's and Mapp's review, the four dimensions of parental involvement examined were communication, parental educational aspiration, involvement at home and school, and home supervision. The NELS:88 base-year (1988) data was used, as well as the first (1990) and second (1992) follow-up data. The nationally representative sample included 24,599 eighth-graders (Asian American 6.4%, African American 9.8% Hispanic 12.5%, White 64%). Information on demographic, academic, social, psychological, and familial variables related to parental involvement was collected from questionnaires administered to students, parents, and teachers. The latent growth model (LGM) was used to address variations caused by developmental changes over the study period, as well as to capture individual differences over that same period. A second-order LGM was used to address measurement errors that would not have been addressed in some indicators. Parental educational aspiration and parental communication were crucial in improving students' educational aspiration (a mediating variable). The more often parents communicated with students about school and educational plans, the greater were the students' educational aspirations, and their academic achievement. The indirect effects of these two parental involvement factors on students' achievement were long lasting (at least four years) and stable across ethnic groups. This study also indicated that parents in different ethnic groups are involved in different ways. For example, African American parents were more likely to visit their children's classroom, while Asian parents were more involved in their children's academic activities and had higher aspirations for their children's academic achievement. Since parental educational aspirations for students' academic achievement had a positive effect across all ethnic groups, this suggests that further research in this area could contribute significantly to the literature on parental involvement.

The evidence that parental involvement is associated with academic achievement is well supported. However, the importance of understanding the effects of various aspects of parental involvement on different measures of achievement, in different content areas, and on different groups of children, should not be underrated or ignored. It is important to note that the effects of parental involvement may be different for specific content areas, as opposed to the broader field of knowledge, and may differentially affect how students perform on standardized tests vs. classroom-specific tests (Jeynes, 2003). Also, some programs to promote parental involvement may not be very effective because they may not be built on the understandings of particular groups of parents' practices and beliefs. Understanding how parental involvement affects middle grades students' mathematics achievement is essential. Learning mathematics is challenging for many middle grades students, and may also be problematic for some parents. It would be beneficial for researchers to consider investigating what aspects of parental involvement would be most effective for middle grades students' achievement—particularly in mathematics. In the following two sections I will discuss the literature on adolescent learners followed by mathematics teaching and learning in order to make the necessary connections that will help to focus this study.

Adolescent Learners and Learning

Young adolescent learners are at a crucial point in their development. This is perhaps the most critical stage in their development, because it is at this stage that they begin their transformation from childhood into adulthood. Here they start to experience physical changes and become conscious of their bodies. They feel emotionally insecure, have a need to belong and to be loved, and go through a cognitive, social, physical, and emotional roller coaster. At this

period in their lives, they need constructive criticism and direction. Yet, their need for and independence and self-worth permeate their daily decisions and activities.

Efforts to improve mathematics performance could be undermined if middle grades students' developmental characteristics (as they move through the adolescent period) are not taken into consideration. Research has shown that children's developmental needs vary significantly at different grade levels. Piaget's theory of cognitive development indicates that children pass through stages of cognitive development, and that middle grades age students are at a transitional stage between concrete to abstract thinking. Vygotsky's (1978) zone of proximal development theory extends Piaget's cognitive development theory. This zone indicates a distance between real and potential development, wherein facilitation by adults, helps students to grasp and deepen concepts to be learned, and steers them towards independently solving similar or related problems in the future (Blanck, 1990). Vygotsky's theory suggests that adolescents need help to negotiate this difficult period of cognitive development. Also, Erickson's (1963; 1983) theory of psychosocial development suggests that middle grades age students are passing through a critical stage of development wherein feelings and social development are important, and personal and social relationships influence the way they respond to basic needs.

At the middle grades age, all children begin to separate from caregivers and place more trust in the environment as they grow older (Meece, 2002). Erickson suggests that adolescents go through a stage of identity vs. role confusion—a time (10-20 years of age) when they must find out who they are, and what their role in life is. He suggests that their needs be met by giving them opportunities to explore alternative options and roles. He also suggests that early adolescence is a period for development of self-control, initiative, and purpose (Meece, 2002),

and that they will begin to separate themselves from adults and from old and traditional habits in order to create their own identity and sense of purpose.

Bronfenbrenner's (1979) ecological theory also suggests that adolescents are influenced by their environment and the significant others that function within it. The support of significant others such as parents and other responsible adults, could potentially provide structure—a strong base from which adolescents could develop and build habits that could lead to success and wholesome adulthood. These characteristics of middle grades students are important for examining best practices for increasing middle grades students' achievement.

Attitudinal and Motivational Factors of Mathematics Learning

Researchers have also asked the questions of how, and to what extent, do specific students' attributes contribute to their mathematics achievement. Hammouri (2004) used data from 3,736 thirteen-year-old Jordanian eighth graders who participated in the TIMSS study by completing a student questionnaire and taking a mathematics test. His objective was to examine the relationship between attitudinal and motivational student-related variables related to mathematics achievement of eighth graders in Jordan. Affective variables included in the analysis were educational aspirations, student's attitude, success attribution, confidence in ability (self-efficacy), and perception of the importance of mathematics. He hypothesized that mathematics achievement is affected by, but not caused by these variables, and that each variable had a positive effect on mathematics achievement.

Hammouri (2004) found that all of the variables in his study showed positive relationships to mathematics achievement except student's attribution of their mathematics success to luck, and their friends' perceptions of the importance of mathematics. The studies also revealed that people who are closely connected to students have a significant influence on

shaping their beliefs and attitudinal orientations, and that maternal perception of the importance of mathematics had the strongest positive total,0 as well as direct effects on mathematics achievement. This specifically implies that students who believe that their mothers think mathematics is important achieve higher grades in mathematics, and more generally implies that teachers and other significant persons in students' lives also influence their academic achievement. However, Hammouri cautioned that variables of influence might differ among cultures. Another implication of Hammouri's findings is that teachers should understand what students' believe about their reasons for academic performance, and how to deal with them at the instructional level.

Schiefele and Csikszentmihalyi (1995) examined 108 ninth and tenth graders on relationships between interest, achievement motivation, mathematical ability, quality of mathematics experience, and mathematics achievement. Students completed interest ratings, an achievement motivation questionnaire, and the Preliminary Scholastic Aptitude Test (PSAT). They used grades from the year prior to the commencement of the study, and from the following three years. Students' mathematics course levels were also included. They found that quality of mathematics experience was related to students' interest in mathematics, and to a lesser extent, achievement motivation. However, they also found that interest was not correlated with ability as they predicted; and that self-esteem, cognitive efficacy (concentration), or skill, all seem to be unaffected by ability. This implies that having the ability to do mathematics does not in itself lead to interest, self-esteem, concentration, or skill in mathematics.

Therefore, academic achievement in mathematics requires more than just ability. There needs to be a source of activation for these characteristics such as interest, self-esteem, and academic skills. Effective instruction in mathematics should be the main source for the

development of interest, self-esteem, as well as skills in mathematics students. Schiefele's and Csikszentmihalyi's findings were also supported by Hammouri's (2004) study reinforcing that other than ability, affective factors are also important for mathematics achievement. Gibson and Jefferson (2006) noted that adolescents undergoing physical, social, and cognitive changes integrate their own perceptions with that of significant others, and that perceived parental involvement influences self-concept. Students with higher academic self-concept earn significantly higher mathematics grades (House, 1993).

Schweinle, Meyer, and Turner (2006) explored the relationship between motivation and affect, and motivation and teachers' instructional practices on 42 fifth and sixth graders of mixed ability from a White middle class suburban school. The students reported on social affect (feelings about social experiences in the classroom setting), personal affect (feelings about themselves as individuals), efficacy (perceived skills and abilities), and challenge/importance of mathematics learning to themselves and to others. Schweinle et al. found that affect is essential to students' mathematical experience, that students perceived mathematics skill in conjunction with affective variables (e.g., student's feelings about mathematics), and that students perceive challenge as a threat to efficacy.

Schweinle et al. (2006) corroborated an earlier study by Stevens, Olivarez, Lan, and Tallent-Runnels (2004) that examined 258 Latino and Caucasian ninth and tenth graders in Texas to understand how their self-efficacy and motivation relate to their mathematics performance. Stevens et al. (2004) found that similar motivational systems exist to predict mathematics achievement across ethnicity, and support the finding that self-efficacy predicts motivational orientation and mathematics achievement. Their findings that students' beliefs and motivation play an important role in mathematics achievement suggest that researchers should

pay attention to these factors and should examine ways to provide support for the development of these qualities in students. The findings of House (2006) corroborated the motivational factors discussed by the other studies mentioned in this section—that students who had a positive attitude toward mathematics achievement had higher scores. In addition, House found that students who attributed mathematics success to luck had lower scores, and that students that indicated that they enjoyed learning mathematics and that mathematics was easy, tended to score higher in mathematics.

Students' attitude and motivation towards mathematics success has a strong relationship with parents' expectations and aspirations for their children's education (Spera, 2006). The finding that students' beliefs and motivation have an important role in mathematics suggests that when they believe that parents have high expectations and aspirations for their success, they may be motivated to succeed. Research shows that parental expectations and aspirations in different ethnic groups contribute to students' mathematics achievement (Sui-Chu & Willms, 1996; Yan & Lin, 2005). In particular, studies show that mothers in some cultural context (for example in Jordan) significantly influence adolescents' academic achievement (Hammouri, 2004).

Mothers' Involvement

The role of mothers in the term "parental involvement" is often not given adequate attention. Although both parents and other family members participate in children's education, studies show that a mother's role is very significant, particularly in terms of children's mathematics learning. Muller (1995) used NELS:88 data on eighth graders and their parents that examined the effects of maternal employment on students' mathematics achievement. Muller's study showed that children perform better when their mothers spend less time working outside of the home. However, when unsupervised time after school is controlled, the gains of students'

whose mothers are not in the work force are significantly less. Muller cautioned that other non-measured factors in the study could have influenced the results. Her findings suggest that children of mothers with more time to spend at home with them, are more likely to show increased mathematics scores, and that the extent that mothers supervise the children after school influences mathematics achievement. This is inconsistent with what Fan and Chen (2001) found in their meta-analysis—that home supervision had a small negative effect on mathematics achievement. However, that finding could be because home supervision is a broad concept, and individual studies may have varied by types of supervision strategies used, some of which may not be academically oriented. Also, Fan and Chen suggested that this could be the result of statistical collinearity among the predictors (one set of variables influencing another's weight estimation).

In their study of parental involvement in young adolescents' learning, Shumow and Miller (2001) found that, although mothers appear to be more involved at school, both mothers and fathers are equally involved at home. Baker and Stevenson (1986) found that mothers' types of parental involvement strategies do not differ, but that the way they are implemented differs by their socioeconomic status. Shumow's and Miller's (2001) findings show that parents' academic involvement at home showed a negative relationship with academic achievement, but added their conjecture that parents of struggling students were more involved in homework assistance. This could suggest that students' low performance existed before parental involvement, and that a follow up study of a longer period than one year would perhaps be a better indicator of the true effects of parental involvement on achievement. They also noted that parents of more successful students were more involved at school, and that more educated parents helped their children more with homework.

Hammouri (2004) used data from the Third International Mathematics and Science Study (TIMSS) to understand how attitudinal and motivational variables influence mathematics achievement. The five variables were examined in data from 3736 thirteen-year-old Jordanian eighth graders. The factors were mothers' perception of mathematics importance, friends' perception of mathematics importance, self-perception of mathematics importance, success attribution to hard work, and success attribution to luck. They found that mothers' perception of the importance of mathematics had the strongest positive total as well as direct effects on mathematics achievement.

The studies briefly discussed in this section indicate that mothers' influence and practices are related to mathematics achievement, that increased after-school supervision of adolescents by mothers' influences mathematics achievement, and that mothers' perception of the importance of mathematics influences mathematics outcomes. Also, the notion that mothers' methods of implementing their strategies vary by socioeconomic status, may be an avenue for further investigation that could be supported by studies that suggest that students' backgrounds influence achievement (Baker & Stevenson, 1986; Eamon, 2002, 2005).

Understanding Students' Background

Factors that influence children in learning include belief systems, economic resources, social networks, and history with school (Meece, 2002). Some researchers have explored the relationship between students' ethno-cultural background and mathematics achievement (Martin, 2000; Tsui, 2005; Yan & Lin, 2005). Martin (2000) attempted to understand why African American students continually fall behind in mathematics achievement, and are over-represented in remedial or lower-level mathematics courses, in spite of educational and societal reform efforts to increase mathematics opportunities for all. He questioned whether there were cultural

and linguistic barriers, or socioeconomic disadvantages such as parents' educational backgrounds, that affect mathematics achievement for African Americans. He investigated whether there were structural and economic forces that serve as barriers, and whether teachers develop low expectations for African American students and track them out of mathematics courses. Martin's (2000) research findings showed that environmental conditions influenced students' beliefs about their propensity to succeed and to reap just rewards for their efforts. He noted that when individuals are labeled as inferior or incompetent, their self-efficacy and performance are negatively affected, and that those students' behaviors in school reflect their beliefs of whether or not their rewards will justify their efforts. Martin suggested that African American students had been socialized to believe that they would not reap full benefits for effort that they placed into learning mathematics. They therefore entered the mathematics classroom with low expectations for their success, thus diminishing their motivation to learn mathematics as they found this barrier difficult to negotiate (Brand, Glasson, & Green, 2006). Martin's (2000) research serves as evidence that parents, teachers, and community members could influence African American students' attitude and beliefs about mathematics learning, and about their ability to excel in mathematics and that these factors should be researched more systematically.

Parental Involvement and Adolescents' Achievement

It has been well established that young adolescents are at a critical stage of their development (Erickson, 1983; Meece, 2002; Vygotsky, 1978). I have referenced in this paper that adolescents' needs are peculiar to their developmental characteristics, and that considerations given to these needs and characteristics by the parents/guardians and educators when making decisions on their behalf, could lead to significant educational benefits. According to Bronfenbrenner's (1976) ecological principles, young adolescents are influenced by what goes

on in their immediate environment (school and home), as well as their more distant environment (community/society). It has also been established that parental involvement has a positive relationship with academic achievement (Hoover-Dempsey & Sandler, 1995). Therefore, the people that interact daily with and are closest to adolescent's, and with whom they interact daily, influence adolescent's attitudes and behaviors and have the potential to contribute significantly to their academic achievement. This perhaps makes peers, teachers, and parents (significant others) the most influential people in adolescents' lives (Der-Karabetian, 2004). Research also tells us that when parents pass on their expectations to their children, the behavior outcomes of those children will most likely reflect their parents' expectations (Spera, 2006).

Parental Expectations

Since parental expectations have been an integral part of the studies mentioned previously in this chapter, and have shown a positive relationship with achievement in general, as well as mathematics achievement, I will focus more specifically on it in this section. Phillips (1992) found that parental expectations in adolescents' education have a positive relationship with academic achievement. Trivette and Anderson (1995) also found that parents' educational aspirations have a powerful effect on eighth grade students' academic achievement. If parents expect their children to succeed academically, they may be more likely to become involved in their education in any feasible way they can. However, while parents have expectations for their children, their choice of how they become involved may differ depending on socioeconomic factors (Baker & Stevenson, 1986), their sense of their role in the children's education, and their sense of efficacy for helping their children succeed (Hoover-Dempsey & Sandler, 1995).

As mentioned earlier in this study, Fan and Chen (2001) in their meta-analysis to examine the research on parental involvement in students' academic achievement, found that

parental expectations were significantly related to mathematics achievement. Yan and Lin (2005) and Tsui (2005) also supported Fan's and Chen's finding that parental aspiration/expectations have the strongest relationship with academic achievement. Spera (2006) also noted that adolescents' perceptions of parents' goals and practices relate positively to their internal academic motivation (interest in school, self-regulation, and goal pursuit).

The idea that parents' expectations, aspirations, and goals highly influence adolescents is grounded in ecological theory that explains the influence of the environmental systems that surround adolescents. This theory clarifies the concept of significant others (teacher, parents, peers) functioning within adolescents' immediate environment having significant influence on their attitudes and behaviors (Bronfenbrenner, 1976; Spera, 2006). Gibson and Jefferson (2006) examined the effect of perceived parental involvement and growth-fostering relationships on adolescents' self-concept. The participants were 78 adolescents participating in GEAR UP (Gaining Early Awareness of Readiness for Undergraduate Programs). The results indicate that adolescents' self-concepts are influenced by their relationship with family, peers, and teachers (significant others), and adds to the body of research that has shown that parental involvement has a positive effect on children's behaviors and attitudes, that is reflected in academic achievement.

Research also indicates that family structure and maternal employment relates positively to adolescents' academic achievement (Baker & Stevenson, 1986). Jeynes' (2005) study examined the effects of parental involvement and family structure on the academic achievement of adolescents. He studied four factors – family structure (number of parents living in the home), parents checking homework, parent-child discussions about school, and checking on child's friends. He found that family structure is the single greatest predictor of academic achievement,

parent-child discussion about school also showed a positive relationship, but checking homework, and checking on child friends showed no relationship to adolescents' academic achievement. Jeynes (2005) did not give a clear definition of family structure, but implied that the number of parents living with children determines family structure. It is logical to say that in single parent homes, the likelihood of the parent to spend more time on school and home related activities would be less. However, family structure should not be confused with home structure. Trivette and Anderson (1995) refer to home structure in terms of a structured environment that supports learning. This concept of home structure was more applicable to the current study.

In considering specific parental involvement practices, it could be deduced that checking homework is not the same as providing academic assistance to increase understanding—although it is academic support. Jeynes (2005) did not clearly state whether checking homework means checking for completion, or checking for correctness. His 2005 findings for the effects of parents' checking homework as having a negative relationship with academic achievement is supported by research (Balli, Demo, & Wedman, 1998). However, there are differences in the focus of studies in terms of increased family involvement in homework rather than effective family involvement in homework. Hoover-Dempsey et al. (2001) showed that homework involvement influences academic outcomes. This finding was also applicable to mathematics homework involvement (Sheldon & Epstein, 2005).

Parental Involvement in Homework

Parental involvement in adolescents' homework has been the focus of several studies. Keith and Keith (1993) used a nationally representative sample of 21,814 students from National Educational Longitudinal Study (NELS, 1988) data to examine the effect of parental involvement on eighth grade students' academic achievement. Parental involvement factors

examined included parents' educational aspirations, parent-child communication, home structure, and parental involvement at school. Keith and Keith found that parental involvement leads to increased homework, which is in turn a contributing factor to increased academic achievement. Van Voorhis (2003) completed a study on the effects of interactive homework on middle grades students' science achievement. She wanted to examine the effects of weekly interactive science homework on sixth and eighth grade adolescents' achievement and homework attitudes. She used ten classes with a total of 253 students in an 18-week study. Four classes completed homework without any interaction from family, and in the other six classes, teachers involved parents in homework assignments with directions for family and parent involvement. Students with interactive homework prompts completed more assignments and earned significantly higher science report card grades. The implication for teachers is that well-designed homework that incorporates parent and family participation will increase parents' participation, and consequently students' performance. The implication for parents is that interaction with homework may increase their children's academic performance. Although this study on interactive homework was done with science students, the same result has been found for mathematics students (Balli, Demo, & Wedman, 1998). When examining the research findings, however, one should consider that parental involvement in homework might be stronger for students who are struggling with content (Shumow & Miller, 2001). This might account for some of the variance when effects are examined over several subjects, and points to a need for studies that compare and contrast the relationship of parental involvement with homework in several different subject areas.

The literature on the effects of parental involvement in homework on adolescents' academic achievement suggests that it is important for parents to be involved in children's

homework. Not every child's parents may be able to assist their children with content in every subject area, at every grade level. Shumow and Miller (2001) noted in their study that parents who were high school graduates helped their children more with homework than those who were not. Some parents might not have self-efficacy for helping students in more complex content areas such as science and mathematics. For many parents it may take interventions and initiatives from the schools to help them understand how they can become involved, and provide them with the necessary tools for effective involvement. For some content areas, it may require different approaches or types of involvement. For example, parents may have to give personal assistance with mathematics homework to see the same level of achievement as they would in reading if they just saw to it that the child reads every day. Balli, Demo, and Wedman (1998) found that parents respond to prompts by teachers/schools to become involved in mathematics homework. This implies that although parents may have high expectations for students' education, they may be reluctant to participate in specific types of involvement without direction and guidance from teachers. They may still need to know what the teacher's expectations are, and how they will be able to help their children reach those expectations.

Parental Involvement in Adolescents' Mathematics Achievement

Although parental involvement has been found to have a positive relationship with adolescents' academic achievement in general (Fan & Chen, 2001; Henderson & Mapp, 2002), it is also shown to have a significant relationship with mathematics achievement (House, 2006; Yan & Lin, 2005). Most of the studies on parental involvement with children's mathematics education tend to show that parents' expectations and aspirations for their children's education (e.g., Phillips, 1992; Sheldon & Epstein, 2005; Tsui, 2005) and parental involvement in mathematics homework and home supervision (Balli et al., 1998; Balli, Wedman, & Demo,

1997; Muller, 1998; Sheldon & Epstein, 2005) are significantly related to mathematics achievement. Research also shows that adolescents' views of their mothers' perception of mathematics influences mathematics achievement (Hammouri, 2004; Muller, 1995). The literature in these areas will be discussed in subsequent sections.

Parental Expectations and Adolescents' Mathematics Achievement

Parents may get involved in their children's education because they have expectations that they will excel academically, and therefore their desire (aspirations) for that success might lead them to take actions toward that end. Parents' expectations and aspirations are a basis for their involvement in their children's education, and partially explain why parents become involved in their children's education. Hoover-Dempsey's and Sandler's (1995) framework explains why and how parents become involved in children's education, and the effects of involvement on academic achievement substantiates this concept. The effects of parental expectations on mathematics achievement and on achievement in general, have been explored by researchers (Goldenberg et al., 2001; Tsui, 2005; Yan, 1999; Yan & Lin, 2005), and the findings are consistent. Parental aspirations contribute significantly to students' mathematics achievement specifically (Aldous, 2006; Fan & Chen, 2001; Trivette & Anderson, 1995), and to academic achievement in general (Catsambis, 1998; Fan & Chen, 2001; Henderson & Mapp, 2002; Phillips, 1992).

Tsui (2005) completed a study on the effects of family, home, and parenting on Chinese and American eighth grades students' mathematics achievement. Tsui used standardized test scores and survey-data for children in China and America. Only American students with no more than one sibling were chosen for the study. He found that Chinese parents had higher expectations for mathematics than American parents did, that their expectations had a greater

influence on academic achievement than did the expectations of parents of American eighth grade students, and that Chinese parents talk with their children more about school. He also added that this could be influenced by the one-child rule (one birth child per family) in China that leads to parents having more time to focus on the child. There is a universal concern for education in Chinese society that filters into children's attitude toward education and willingness to work hard in mathematics. Parents' expectations about their children's mathematics performance appear to have a significant influence on their success in mathematics. This is also supported by Cao, Bishop, and Forgasz (2007) as well as other studies, and is a good example of "high expectations producing high achievement."

In their quest to understand the effects of parental involvement on mathematics achievement across racial and ethnic groups, Yan and Lin (2005) used four-year longitudinal data from the NELS:88 study's nationally representative sample of eighth graders at the second follow-up survey period. Follow-ups were conducted every two years after the initial study in 1988 through college. At the second follow-up, the original eighth graders were 12th graders. Yan and Lin viewed parental involvement from a social capital perspective and found that parents' educational expectations for their children's education had the strongest relationship with mathematics achievement.

Der-Karabetian (2004) also completed a study on the effects of perceived family process factors on mathematics performance in a group of Latino, African American, and European American middle grades students. They attempted to identify factors that contributed to middle grades students" mathematics achievement. Perceived family process factors were defined as: students' perception of parents' attitude toward mathematics, parents' expectations, parents' interest in mathematics, and parents' academic support. Der-Karabetian found that parental

involvement improved overall academic performance as well as mathematics performance, and that children's' perception of the expectations of significant others (e.g., parents, teacher, etc.) influenced their attitude and performance in mathematics. However, he also found that the effects of parental involvement varied depending on age, grade level, ethnicity, and socioeconomic status. In addition, Der-Karabetian pointed out that ethnicity interacts with other factors such as socioeconomic status and sociocultural factors in terms of their effect on mathematics performance.

The findings of the studies on parental expectations and aspirations as they affect achievement show a positive relationship to academic achievement in general, and appear to hold true when it comes to parental expectations as they affect mathematics achievement specifically. This implies that high parental expectations of children's mathematics performance could be beneficial to students. If parents' expectations are low, they may not be motivated to take steps to be involved with children's learning, and the responsibility would fall within the realm of the schools' responsibility to educate and assist parents to materialize those expectations. If this is so, then every effort by educators to encourage and motivate parents to develop these expectations about their children's mathematics performance could have a significantly positive impact.

Studies have shown that students who are motivated to achieve in mathematics tend to improve their mathematics performance (Hammouri, 2004). It is also clear that parental expectations act as a motivator for academic achievement. It is important then, to look at some other factors that motivate adolescents to be successful in mathematics, and to determine how parental involvement may influence those factors. Several studies have shown that adolescents' academic motivation relates positively to their academic achievement (Alfaro, Uma-Taylor, &

Bamaca, 2006; Gonzalez-DeHass, Willems, & Doan Holbein, 2005; Hammouri, 2004; Spera, 2006). Motivation may occur internally or externally based on many reasons. Ecological theory may explain external motivation as it suggests that the environment influences individuals' attitudes and propels their actions, and that actors moving within and between children's environmental systems influence children's attitudes and behavior (Bronfenbrenner, 1976, 1979).

Alfaro et al. (2006) used an ecological approach to examine the extent to which fathers, mothers, and peers influence Latino adolescents' academic motivation. They referenced four factors that affect academic motivation: (a) parental academic support, (b) teachers' academic support, (b) peers' academic support, and (d) variation in school characteristics. They found that Latino girls' academic motivations were positively related to mothers' and teachers' academic support, while Latino boys' academic motivation was positively influenced by their fathers' and teachers' academic support. These findings suggest that Latino adolescent girls and boys reacted differently to parents on the basis of gender. It puts forward the thought that there is a probability that children from other ethnic groups may respond differently to parental involvement on the basis of gender. Many families in the U.S. have heads of households who are single mothers. This may call for studies on parental involvement that pay more attention to responses by gender, or to the effects of both parents' involvement, as well as individual parental involvement on achievement.

The role of parents as significant others in children's lives has a bearing on their motivation to excel in mathematics. Since young adolescents are influenced by interactions, attitudes, beliefs, and value-systems occurring within their environments (Bronfenbrenner, 1976; 1979), if children perceive that learning mathematics is important to their parents (significant others) and is useful within their surrounding environment, they will be more likely to be

motivated to excel in mathematics. I refer again to Hammouri (2004) who used TIMSS data to examine affective variables associated with the mathematics achievement of 3,736 Jordanian eighth graders. These variables examined included educational aspiration, attitude, success attribution, confidence in ability, and perception of the importance of mathematics. One of the findings of Hammouri's study was that children's perceptions of the importance of mathematics are significantly related to mathematics achievement. Therefore, it is logical to consider that an indirect effect of parental involvement on mathematics achievement might be the motivation that they receive through their perception of the importance of mathematics imparted to them by their parents. Schiefele and Csikszentmihalyi (1995) noted that students' interest was a significant predictor of mathematics performance for 108 ninth and tenth grade students who completed interest ratings, the Scholastic Aptitude Test, and an achievement motivation questionnaire. They examined the interactions of ability, interest in mathematics, and achievement motivation with quality of experience when doing mathematics. They hypothesized that interest is a greater predictor of quality of experience and achievement than achievement motivation, and that both interest and achievement motivation predict quality of mathematics experience. They proved their hypothesis that interest predicted quality of experience doing mathematics, and mathematics achievement. The implication of this study for adolescents is that if students are interested in mathematics, they are inclined to achieve at higher levels and to have a better experience accomplishing it. This finding offers parents and teachers an opening to increase mathematics performance in adolescents. While reiterating that it has been established that parents (as well as teachers and peers) are influential when it come to adolescents, it seems reasonable to suggest that one thing that parents could do to increase children's mathematics achievement, is to help them develop and maintain an interest in mathematics, and to raise their

expectations of their children's mathematics performance. This might help motivate students to work hard in mathematics, and improve their skills and confidence in doing mathematics.

Parental Involvement in Mathematics Homework

Research on parental involvement in children's homework shows a significant relationship with achievement in general (Van Voorhis 2003). However, drawing from Jeynes' (2005), and Zick's, Bryant's, and Sterbaka's (2001) study, simply checking homework does not show a significant relationship with academic achievement. Studies have also suggested that increased parental involvement may lead to increased time spent on homework by adolescents (Balli, Demo, and Wedman, 1998; Fehrmann, Keith, & Reimers, 1987). Studies also suggest that an increase in the amount of homework completed, as well as an increase in the time spent on homework lead to increased academic achievement (House, 2004; Keith & Keith, 1993).

Sheldon and Epstein (2005) used longitudinal data from elementary and secondary schools to examine how family and community activities relate to adolescents' mathematics achievement. They based the variables in their study on Epstein's (1995) typology for parental involvement practices for school. They examined the effects of family and community involvement from the perspective of the school, and used variables that relate to school characteristics, and school measures of mathematics achievement. They completed an analysis after controlling for prior knowledge of mathematics, and found that subject- specific practices in the home, school, and community may help increase student's mathematics achievement. They noted that children's home environment (level of support of mathematics at home), and parents' beliefs and expectations for their children's mathematics performance predict mathematics achievement. The outcome of this study suggested that parental involvement in children's mathematics requires home-school partnerships as well as the development of specific practices

focusing on enhancing mathematics achievement. Balli, Demo, and Wedman (1998) found that when parents are prompted to do mathematics homework with their young adolescent children, their involvement increases. However, their study did not show that mathematics achievement increases as a result of parental involvement. This result is contrary to other findings, and could be the result of: (a) the sample being from just one school, (b) the type of homework activities given, (c) the duration of the study may have been too short, or (d) the parents' level of ability to help with their children's mathematics learning was limited.

Young adolescents are going through a critical stage of their development. In mathematics, they need parents', teachers' and peers' assistance to help them negotiate the transition from the concrete stage of cognitive development, to the formal operations stage (abstract thinking) of cognitive development. However, the way that parents become involved in their children's education may depend on their sociocultural orientation, which influences how they perceive their role, their feelings about their ability to help, and their beliefs and values about school and about particular subjects (Green & Hoover-Dempsey, 2007; Hoover-Dempsey & Sandler, 1997). The next section examines sociocultural aspects of parental involvement in mathematics.

A Sociocultural Perspective of Parental Involvement in Mathematics

The reasons for parental involvement and the ways that parents become involved in their children's education will vary for different reasons that may have sociocultural explanations, psychological explanations, socioeconomic explanations, as well as other explanations for their involvement. Hoover-Dempsey's and Sandler's (1997) psychological theory also ties into sociocultural explanations because how and why parents become involved may be different across racial and ethnic groups. Hoover-Dempsey & Sandler (1995) refer to findings of research

grounded in the systematic examination of parental involvement and its relationship to academic achievement (Hoover-Dempsey & Sandler, 1995; Keith & Keith, 1993; Sheldon & Epstein, 2005). Their three constructs that explain how and why parents become involved are: parents' beliefs about their role in their children's education; parents' sense of efficacy for helping their children to achieve academic success; and general invitations, demands, and opportunities for parental involvement given by their children and the schools. Each of these constructs may be based on culturally-related variables. Many studies used sociocultural theory to explain parental involvement in their children's mathematics education. This theory implies that parents' behavior in relation to their children's education is a function of cultural norms, values, and social capital. Yan & Lin (2005) suggest that parental involvement is a form of social capital that may explain some of the variance in its relationship to mathematics achievement of different ethnic groups. In their study of 12th grade Asians, Latinos, African Americans, and Caucasians, they found that close family relationships in minority students positively influenced their mathematics achievement. They also found that regardless of race or ethnic background, educational expectations had the greatest influence on adolescents' mathematics achievement. Tsui (2005) also completed a study that suggested that parents of students with different cultural orientations may have different levels of expectations about their children's mathematics performance, and that those children tend to be influenced according to those levels of expectations. As mentioned earlier, Tsui examined eighth grade students in China and the United States to study the effects of socioeconomic status, parenting, and home environment on mathematics achievement. They found that perhaps because of the cultural norms of China (instructional, societal, and economic), parents of Chinese eighth grade students had higher expectations of their children's mathematics performance, and talked more with them about

school than did parents of American eighth graders. Tsui's finding that the relationship between Chinese eighth grade students' parental expectations and their mathematics scores was greater than that of American students, and that Chinese student's worked harder at mathematics than American students, reinforced the idea that cultural orientations may influence levels and types of parental involvement.

However, findings of these studies suggest that it is important for educators to understand how and why parents become involved in their children's education, so that quality programs and initiatives may be developed and implemented to increase parental involvement. This is particularly important in the case of mathematics because it becomes more complex as the grade levels increase. Therefore, many parents may feel that they do not have the skills to provide assistance with homework as mathematics becomes more difficult.

One construct provided by Hover-Dempsey and Sandler for explaining why and how parents become involved is their sense of efficacy for helping their children achieve academic success. If parents do not feel capable of helping their children in mathematics, they may not be as involved in helping with mathematics homework as the materials and content get more difficult. Eccles and Harold (1999) suggested that as parents feel less competent to help with the more advanced instruction, their involvement might decline. This could account for the decline of parental involvement in middle and high school, and may contribute to the decline in middle grades mathematics scores. However, if parents think mathematics is important for children to learn, they will pass on that perception to their children who may then be more motivated to learn (Spera, 2006).

As children move on to middle school, they may not be receiving as much help in mathematics at home as they perhaps did while attending elementary school. This may be a

reason for findings in the studies that show that parental involvement decreases in the later grades (Brough & Irvin, 2001; Epstein, 1995), and the studies that show that mathematics achievement decreases in the middle and high school years (Haycock & Ames, 2000). Parents help children with content if they feel that this is a part of their role as parents. Role perception in children's mathematics education may be partially attributable to ethnic or cultural orientations, and partially to parents' educational background or socioeconomic status.

Rech and Stevens (1996) focused their study on attitudes and mathematics achievement of 251 fourth and eighth grade African American students with economically stressed families. They found that African American students in that cohort had a negative attitude towards mathematics, and that these attitudes significantly predicted mathematics achievement. Brand, Glasson, and Green (2006) found that African American students entered the mathematics classroom with low expectations for their success, thus diminishing their motivation to learn mathematics as they found societal barriers difficult to negotiate. Ma (2005) found that whereas younger Caucasian and Asian students showed the best mathematics achievement growth rate, older Caucasian and Asian students with low family income status grew at the worst rate when compared to African American and Latino students.

Sociocultural factors appear to impact mathematics achievement in adolescent students. However, it is important to develop research that investigates whether any negative relationships in achievement based on sociocultural, socioeconomic, or other reasons, can be avoided or diminished by proactive schools that cater to the needs of parents and equip them to be effectively involved in their children's mathematics education and their education in general.

Conclusion

While research has established that parental involvement is associated with academic achievement for all children (Henderson & Mapp, 2002) it has also focused on the effects of parental involvement for adolescents' achievement (Jeynes, 2005). For the most part, the areas of focus and the findings are similar. However, for parental involvement in adolescent's mathematics achievement, the quantity of studies appear to be few overall. However, the proportion of those studies that focus on parental expectations for adolescents' mathematics achievement, and parental involvement in adolescent's mathematics homework, is greater than in other areas. Other types of parental involvement from the Epstein (1987) typology such as parent-teacher communication, and parental involvement in school-related activities were few, but also show positive relationships with academic achievement. However, from the school's perspective, Epstein (1987, 1992, and 1995) has repeatedly shown that families, school, and community partnerships are significantly related to parental involvement.

One of the most salient indicators of parental influence is that adolescents, being at a stage of development where their self-concept might be weak, and self-confidence may need boosting (Manning, 1993; Gibson and Jefferson, 2006), respond very significantly to parental expectations (Yan & Lin, 2005; Tsui, 2005). For most studies in which the effects of parental expectations were compared with mathematics achievement, highly significant relationships were shown. It could be assumed that high parental expectations not only motivate students to do mathematics, but that high expectations also increase students' self-confidence and self-esteem.

Studies also indicate that students' attitudinal and motivational factors increase mathematics achievement (Hammouri, 2004) and that these characteristics in students may be influenced by parents' cultural or socialized beliefs and expectations about their children's

education (Martin, 2000). Schiefele and Csikszentmihalyi (1995) also showed that adolescents' interests predict mathematics achievement. Students may gain interest if they perceive that mathematics is important to their parents. The role of parents in this light could be to help students see how mathematics can be important and relevant to them. However, this could be an easier task if teachers and parents work together with this goal in mind.

Some studies examine the effects of culture and parental involvement on mathematics achievement. It has been noted that cultural and societal norms may reflect parents' practices (Tsui, 2005). Chinese parents have been shown to hold very high expectations for their adolescents' mathematics achievement. This has been explained to be one of the reasons why Chinese adolescents outperform students from other ethnic origins in the United States, as well as outside the U.S. Tsui (2005) suggested that because of the high expectations of Chinese parents, students work harder at mathematics than those from other ethnic backgrounds. The implication here is that a concerted effort to raise the expectations of adolescents' parents of all ethnic backgrounds could lead to significant results.

The issue of parental involvement in homework may need to be examined as there have been conflicting findings as to whether or not it increases mathematics achievement. Shelton and Epstein (2005) indicated that parental involvement in homework is associated with mathematics achievement. Yet, Balli, Demo, and Wedman (1998) found that there was no relationship between the two variables, although their study showed that interactive homework did increase family involvement. Their findings that interactive homework does increase parental involvement, serves to reinforce Sheldon's and Epstein's (2005) suggestion that mathematics homework should be properly designed to include parents, while offering adequate and

appropriate learning opportunities for students. Epstein and Van Voorhis (2001) also suggested that the design of homework is important.

The fact that both parental involvement in children's mathematics learning (Haycock & Ames, 2000; Muller, 1998; Spera, 2005) and mathematics achievement levels decline in grades 5 through 8 (Haycock & Ames, 2000; Heller, Calderon, & Medrich, 2003), sends a message that the two factors may be related. Hoover-Dempsey's and Sandler's (1997) framework for parental involvement suggests that parents must have a sense of efficacy for helping their children succeed—which perhaps they do not have for middle grades mathematics.

Another reason for the slump of mathematics achievement in the middle grades could be that at their stage of development, young adolescents want to become independent, and parents' sensitivity to this may cause them to loosen their hold, and allow their children a chance to make responsible decisions. This could be a part of the explanation for the decline in parental involvement in the middle grades, as well as for the decrease in mathematics achievement at the middle school level mentioned earlier in this paper. There may also be an issue of the inadvertent lowering of parental expectations. If the parents think the content is difficult for them, they may unknowingly pass that attitude/idea on to the child, who would then have an excuse for not being able to achieve mathematically.

In summary, research does show that parental involvement is positively associated with adolescents' performance in general, as well as in mathematics. However, the findings for the relationship of parental involvement to adolescents' mathematics achievement need more in-depth research in order to provide more specific information about what could be done to improve the quality of parental involvement in adolescents' mathematics education. For example, studies could be undertaken to determine what factors contribute to effective parental

involvement in adolescents' mathematics homework, or what needs to be done to help parents increase their expectations for their children's' mathematics performance. In addition, knowledge of the aspects of parental involvement that contribute most significantly to adolescents' mathematics achievement could greatly assist in providing more guidance for teachers, parents and students.

Parents and teachers are significant adults in middle grades students' daily lives at home and at school. They are therefore in a position to provide academic and personal guidance and support that could help them become academically successful and developmentally whole. In terms of academic support for middle grades students, Vygotsky (1978) suggests that support from adults is necessary to help students make the concrete-to-abstract connection in the cognitive process. This supports Piaget's theory of cognitive development during the adolescent period that addresses children's transition from the concrete operations to the formal operations level of cognitive processing, and reiterates the need for parents to become more involved in their children's learning. Also, because mathematics often involves abstract concepts, adolescents (middle grades students) will benefit from appropriate support from capable adults both at home and in school.

CHAPTER 3

METHODOLOGY

The goal for this study was to determine the relationship between parental involvement and middle grades students' mathematics achievement. It was designed to help explain which aspects of parental involvement are most significant to mathematics achievement for middle grades students. This chapter provides a description of the procedures that were used in the study, a discussion of the variables, a description of the sample, the data collection process, the instruments used to collect information, and data analysis procedures.

Quantitative survey methods were used to gain understanding of parental involvement in middle grades students' mathematics achievement. Data were collected through questionnaires given to the parents of three interdisciplinary teams of middle grades students. The mathematics teacher on each team distributed the questionnaires to students to take to their parents. The teachers attended a presentation designed to give them information about the study, how to explain the study to the students; the incentives given (each class period with the greatest response rate on their team received a pizza party); and the criteria for receiving the incentives. The criterion for the incentive was a completed questionnaire returned within a one-week time frame. The mathematics teacher on each team collected the completed questionnaires for their team by periods and returned them to the researcher.

Restatement of the Problem

Because of mathematics reform efforts to increase mathematics achievement at all levels, and because it has been established that parental involvement is associated with academic achievement, the research community has launched more and more studies to examine the effects of parental involvement in children's mathematics achievement (e.g., Phillips, 1992; Sheldon &

Epstein, 2005; Tsui, 2005; Yan & Lin, 2005). However, not many of those studies have focused on middle grades students, and those that did, did not examine parents' behavior specifically in terms of their involvement in activities that are more directly related to children's mathematics education. An important area that has not been well researched is the hypothesis that parents' perception (beliefs, attitudes, expectations, and sense of efficacy) about mathematics may influence their involvement in children's mathematics learning. Since it has been established that parents have significant influence on children's behaviors and attitudes (Bronfenbrenner, 1979; Hammouri, 2004), it is important that all factors that might influence the effectiveness of parental involvement be examined for specific subject areas. The focus of this study is on parental involvement aspects that are most often indicated in studies as significantly influencing mathematics achievement (see Chapter 2 on mathematics achievement).

Parental involvement in children's education at home, parental involvement in homework, parents' attitudes and beliefs about education and mathematics, and parents' self-efficacy for helping their children succeed in mathematics were examined for their relationship with middle grades students' mathematics achievement. This study not only has the potential to contribute to the body of literature on the effects of the practical aspects of parental involvement on mathematics achievement in the middle grades, it also has the potential to support findings that suggest that parents' beliefs and attitudes towards mathematics influence their children's mathematics performance, particularly mothers (Hammouri, 2004; Muller, 1995). In addition, as the mathematics curriculum becomes more and more rigorous, so much greater is the need for the examination of parents' self-efficacy about helping their children to become successful in mathematics, particularly in middle and high school.

Research Questions

In order to focus this investigation, the following research questions have evolved from the purpose of the study:

1. What is the extent of parental involvement in middle school students' homework, especially in mathematics?

    (1a) What percentage of parents is involved in children's homework, in general?

    (1b) What percentage of parents is involved specifically in children's mathematics homework?

2. What is the relationship between parental involvement in general and children's achievement, especially in mathematics?

    (2a) What is the relationship between parental involvement in general and children's general achievement?

    (2b) What is the relationship between parental involvement in general and children's mathematics achievement?

    (2c) What is the relationship between parental involvement in mathematics and children's mathematics achievement?

3. What are middle school parents' beliefs, expectations, and self-efficacy about mathematics?

    (3a) What are parental beliefs about the importance of mathematics?

    (3b) What are parental expectations about their children's performance in mathematics?

    (3c) What is parents' perception about their self-efficacy for middle school mathematics?

4. What is the relationship between parents' beliefs, expectations, and self-efficacy about mathematics and their involvement in their children's mathematics homework?

(4a) What is the relationship between parents' beliefs about the importance of mathematics and their involvement in mathematics homework?

(4b) What is the relationship between parents' expectations about their children's performance in mathematics and their involvement in mathematics homework?

(4c) What is the relationship between parents' self-efficacy for helping their children succeed in mathematics and their involvement in mathematics homework?

The questionnaire (see Appendix A) sought to obtain responses from parents that would be appropriate for measuring each of the variables that helped to answer these questions.

Participants

The participants were seventh grade students in a Georgia middle school of over 900 students located in the metro-Atlanta area. The school has a magnet program for high achieving students in grades seven and eight. These students (most not living in the community) qualify for the program by entering a lottery if they receive 85% or higher for reading and mathematics on the Iowa Test of Basic Skills test. The students in the magnet program are placed on teams that rotate separately and apart from the regular students. Magnet students are bussed to school from all parts of the county. The rest of the school consists mostly of students living in the vicinity of the school. However, about 5% of the students from other school communities get special permission to attend, and about 15% attend through a No Child Left Behind (2001) mandate that allows students from schools that fail Annual Yearly Progress (AYP) under the Act, to attend a school that passed AYP in another area. NCLB stipulates the achievement and attendance criteria

for schools to pass AYP. The school has met AYP criteria for every year since its inception in 1989.

The school is located in a middle class community with a median family income of about $45,882 (U. S. census 2000). The student body consisted of approximately 27 % Caucasians, 54 % African Americans, 9% Hispanic students, 9% Asian/Pacific Islanders, and 1% from other ethnic groups (Table 1). The ESOL population makes up approximately 3% of the school, and children with special needs make up 8%.

Table 1

Breakdown of Students by Percents

Ethnicity	Sample %	School %
African Americans	57.1	54
Caucasians	22.3	27
Hispanic	6.0	9
Asians	11.4	9
Other	3.3	1
Program		
ESOL	2.2	3
Special Education	2.7	8
Magnet	38.0	30
Regular	57.1	59

Initially, the magnet students were not to be a part of the study to prevent too large a proportion of high achieving students in the sample. However, because of the non-responsiveness of an entire team of students, the magnet group was substituted for that team with the understanding that the findings may only be applicable to this particular group or a similar group of students.

There were two non-magnet interdisciplinary seventh grade teams and one magnet team, totaling about 298 students. Parents of students from the two non-magnet interdisciplinary teams (192 students) and the magnet team of seventh graders (106 students) received questionnaires that were taken home to them by their seventh grade children. Of the 184 students whose parents responded to the questionnaire, 70 were from the magnet team, and 114 were from two teams of students from the non-magnet component of the student body (regular students). Each team of students rotates together to attend mathematics, language arts, science, and social studies classes. On the two regular teams, there were four classes of high achieving students who may have qualified but were not selected by the lottery for the magnet program, and four regular classes of students with mixed ability. The magnet team had four classes of generally high achieving students. One class on each of the two regular teams included about nine (9) students with special needs and a collaborative teacher. The collaborative teacher rotated with those special needs students and worked collaboratively with the regular teachers in each of those students' four core classes. The participants of this study were the parents and students in the four high achievers' classes, four regular classes, and four magnet classes. There were no students with special needs that were identified to have mental or learning disabilities, so all those who returned questionnaires were included in the study.

Students with English as their second language (ESOL) were told to return unanswered questionnaires if their parents were not able to complete it because of limited English proficiency. Three students returned unanswered questionnaires with comments indicating that their parents could not complete the questionnaire, and were excluded from the study. In addition, one item on the questionnaire asked parents to indicate their level of English proficiency to ensure the researcher that all participants completing questionnaires felt competent

enough to complete the questionnaire adequately. There were no other exclusions on the basis of limited English proficiency. Also, in the cases where there were twins or more than one sibling/student in the seventh grade living in the same home and having the same parent/guardian, only one questionnaire went home to those parents/guardians. In this sample, there were six sets of twins among the teams, but only one questionnaire was sent to those homes. The information about twins and siblings was obtained from the registrar and mathematics teachers, and the special education chairperson indicated that all the students with special needs, none of whom had learning disabilities, were eligible participants and were given questionnaires to take home to their parents.

This school and students were chosen because of their accessibility, and because I am a seventh grade teacher at this particular school. The school administrators gave permission for the study to take place at the school, and permission was granted from the Dekalb School Board of Education to complete the study. The mathematics teachers agreed to distribute and collect the questionnaires during their class periods.

Instrument

Parent Questionnaire

The parental involvement questionnaire was used to assess parents' participation in various types of involvement broken into individual aspects or dimensions that are measurable, in order to determine their relationship with middle grades students' mathematics achievement. A copy of the questionnaire can be found in Appendix A.

The variables derived from Epstein's (1995) typology for parental involvement included: (a) parenting (establishing a home environment that supports learning); (b) involvement at home (support and assistance with homework, curriculum-related activities, academic decisions and

planning, and discussions); and (c) school-to-home and home-to-school communication about children's progress. Additional variables included were; parental expectations for children's mathematics performance (Tsui, 2005; Yan & Lin, 2005), parents' beliefs and attitudes about mathematics (Martin, 2000; Hammouri, 2004), and parents' perception about their self-efficacy for helping their children succeed in mathematics (Hoover-Dempsey & Sandler, 1995).

Relevant questionnaire items were selected and reconstructed from four main sources; the National Educational Longitudinal Study of 1988 (NELS:88) parent questionnaire; Hoover-Dempsey et al. (2001), and Hoover-Dempsey and Bassler (1995). Other questions were specifically developed to satisfy the needs of this study.

Independent Variables

The variables that measured parental involvement in general involved parenting activities that were reflected in questions with Likert-like scaled response choices from 1 to 5. These items were compiled to create the following composite variables:

1. Parent-child discussion about school was measured by parent's response to questions about their involvement in discussions with their children about their school day, plans for high school and college, and about report card grades
2. Parental involvement in homework was measured by responses to questions regarding homework activities. These questions focused on how often parents tutored their children, reviewed, checked, or corrected their children's homework in general, and enforced rules about doing homework in the home.
3. Communication with teachers incorporated items that asked about frequency of parents' contacts and meetings with teachers.

4. Parents' educational expectations were measured by items that asked about the grades parents expected their children to receive, and about their expectations regarding college attendance by their children.
5. Home structure was measured by items that measured parents' provision of resources at home; a place for the child to do his/her homework; and the development of a schedule for doing homework, chores, and watching television. Response to items such as, "There is a special place provided at home for my 7th grader to do his/her schoolwork," measured specific types of activities related to students' education in general.

Several questions that focused on parental involvement in children's mathematics were also measured by composite variables, each made up of a set of question items. Composites for the variable parental involvement in mathematics (Table 2) include items about:

1. Parental involvement in mathematics homework.
2. Parent's communication with the mathematics teacher.
3. Parents' educational expectations for the child's performance in mathematics.
4. Parent's general beliefs and attitude about mathematics.
5. Parent's sense of efficacy (self-efficacy) about his/her ability to help the child succeed in mathematics.

Questions on parental involvement in mathematics homework help us to understand how parents participate in their child's mathematics homework. Items such as, "I/we assist, tutor, work with my 7th grader on mathematics homework," measured active participation in mathematics homework. The frequency of contact between parents and teachers, as well as the frequency of meetings between parents and teachers measured parents' communication with the

mathematics teachers. Parents' expectations for their child's performance in mathematics were measured by their response to questions about their child's taking of advanced mathematics in high school and beyond, and how well they expect their child to perform in mathematics. Since parents' beliefs, attitudes, and expectations about mathematics are potentially passed on to children indirectly through parents' behaviors, these variables were also examined for their relationship with parental involvement with middle grades students' mathematics homework. These questions focused on parents' attitude about the importance of mathematics and whether it is necessary for life, and whether or not all students could be successful at mathematics. Question items pertaining to parents' self-efficacy about helping their children in mathematics asked about parents' feelings concerning their ability to help their children in mathematics, their ability to teach the middle grades mathematics curriculum, and their general ability to do mathematics.

Table 2

Parental Involvement Variables

Variables	*Descriptions/Dimensions*	*Questions #s*
Parental Involvement in General	Parent-child discussions about school and education	1-3
	Parental involvement in homework in general	4-6
	Parent's communication with teachers	7-9
	Parent's educational expectations for children	10-11
	Home structure/parenting	12-14
Parental Involvement in Mathematics	Parental involvement in mathematics homework	15-19
	Parent's communication with mathematics teacher	20-22
	Parent's educational expectations for mathematics	23-24
	Parent's beliefs and attitude about mathematics	25-30
	Parent's self efficacy about helping child with math	31-33
General Information	Relationship to student, gender, English proficiency, employment status, education.	34-39

The preliminary descriptive and replicatory research was extended to understand how parental involvement in mathematics homework and communication with the mathematics teacher may influence mathematics achievement. Parental involvement in mathematics homework was measured by parental assistance with mathematics homework, provision of educational resources to support children's mathematics learning, and monitoring/checking children's mathematics homework for completion. Communication with the mathematics teachers was measured by frequency of parent-initiated or school-initiated contacts and meetings with the mathematics teacher.

Factors that might influence parental involvement in mathematics were examined. These factors that might also have an indirect influence on academic achievement, included parental self-efficacy about their ability to help their children succeed in mathematics, parents' beliefs and attitude about mathematics, and parents' expectations for their children's performance in mathematics. These variables are considered indirect because they do not denote overt actions of involvement. However, they may influence the actions that parents take towards involvement in children's mathematics learning.

Parental self-efficacy was measured by parents' confidence level about their ability to help children succeed in mathematics, their feelings about their ability to teach the middle grades mathematics curriculum, and their feelings about their own mathematics skills in general. Parents' beliefs and attitude about mathematics were measured by parents' feelings about the importance and relevance of mathematics, the necessity of mathematics for educational aspirations, the contributions of mathematics to everyday living, and beliefs about whether or not mathematics ability is inherited or achievable with hard work. Parental expectations for children's mathematics were measured by the level of mathematics they expected their children

to take in high school and beyond, and how successful they expected their children would be in mathematics.

Demographic and background information was obtained in order to determine student's ethnicity, socioeconomic status, and parents' English proficiency. The data on ethnicity was obtained from students' test data records; socioeconomic status was acquired from questions about parents' employment and level of education on the questionnaire; and parents' English proficiency was obtained from an item on the questionnaire asking parents to indicate their level of proficiency. The data on ethnicity was used to understand differences in data along cultural lines, and data on parents' employment status and educational level were used to help understand findings about parents' self-efficacy about their ability to help their children succeed in mathematics. Indicators for level of English proficiency were used to make decisions about the ability of parents to interpret questions in the way intended by the researcher, and combined with teacher recommendations and students' feedback, led to the exclusion of some respondents.

Dependent Variables

Commonly used indicators of mathematics achievement are mathematics scores. Researchers have used scores either from teacher assigned report card grades, grade point averages, and standardized test scores to measure achievement. In this study, teacher assigned mathematics grades as well as standardized test scores in mathematics were used to measure mathematics achievement, and overall grade-point averages (GPAs) were used to measure general achievement. The Georgia Criterion Referenced Competency Test (CRCT) mathematics scores for year 2007 is the standardized test that was used to measure mathematics achievement. The mathematics grades and overall GPAs from report cards for the Fall semester 2007 were used to measure mathematics achievement and general achievement, respectively.

The Georgia CRCT is the measure for performance standards in Georgia for language arts, mathematics, science, and social studies. The ranges of CRCT scores that reflect the Georgia Performance Standards for mathematics are defined by levels. A Level 1 score (does not meet expectations) ranging from 650-799 is considered low scoring. A Level 2 score (meets expectations) ranging from 800-849 is considered average scoring, and a Level 3 score (exceeds expectations) is 850 and above. In this study, the raw scores were used to measure mathematics achievement.

The mathematics report card grade from Fall Semester 2007 was used for each participating seventh grade student whose parent completed and returned the parent questionnaire. Report card mathematics grades were used because this is a good measure for mathematics performance that more directly reflects what parents do during the semester to support their children's mathematics learning at school. However, it must be pointed out that teacher-assigned grades are subjective—hence another reason for using standardized test scores to support findings. These measures for mathematics achievement were chosen because, according to the literature, there are differences in relationships between parental involvement and achievement depending on whether standardized scores or teacher-assigned grades are used (Jeynes, 2003). Using both the CRCT mathematics scores as well as teacher assigned mathematics grades in a single study such as this one, where the parental involvement variables focus heavily on mathematics, may help to answer more specific questions about the effect of parental involvement on different measures of achievement.

Permission to conduct the research, and to acquire and use CRCT scores and report card mathematics grades was sought from the school's board of education and from parents. Students' and parents' names are confidential.

Procedure

A consent-letter was sent home to parents telling them about the study and their rights, and requesting consent for their participation, as well as their child's. The letter was accompanied by the parent questionnaire. Parents who agreed to participate by signing the consent letter were asked to complete the questionnaire and return it with the signed consent letter to the child's mathematics teacher. Each parent questionnaire was given a code number that connected the parent with his or her child. Code numbers are derived from the first letter of the mathematics teacher's last name, the class period, the sequence of the names on the class list, students' initials, and the program that they are in (special education, ESOL, regular, magnet). There were no names on the questionnaire, but the numbers on them linked parents to students for the purpose of coordinating data input, and for tracking the response rate.

Parents were asked to return the questionnaires within a week. Students on the two regular teams returned the questionnaires to their mathematics teachers who were also responsible for distributing the questionnaires. Due to an irregular and complex scheduling arrangement on the magnet team in that there were two mathematics teachers assigned to this team instead of one, collection of their questionnaires would pose a problem. Consequently, the social studies teacher on the magnet team distributed and collected questionnaires from those students.

The short turn around time requested was intended to help prevent misplacement of the questionnaire and to increase the response rate. Follow up calls and reminder letters were done after one week to help increase response rates. The collection of the questionnaires continued for one additional week—a total of two weeks. At the end of two weeks, 62% of the questionnaires that were distributed were completed and returned.

Of the three teams participating, about 7% (13 students) were from ethnic backgrounds where English is not the spoken language in the home. Students were asked to indicate on the questionnaire if they believed their parents would be unable to understand and respond to the questionnaire and return it. Teachers also identified students whose parents would not be able to read and interpret English. Parents of students who returned their questionnaires indicating that their parents could not speak or write English well were not included. Parents' English proficiency was also measured through the questionnaire by an item that asked about participants' language proficiency levels. There were no students identified with learning or mental disabilities in any of the classes used for this study.

Data Analysis

Quantitative analyses procedures were conducted in order to answer each of the research questions listed in this chapter. The analyses were conducted according to the conceptual organization of the study displayed in Appendix B. Descriptive statistics were run to examine the extent (percentage) of parental involvement in middle grades students' homework in general (research question 1a), and middle grades students mathematics homework (research question 1b). In answering research question 1b, item 19 on the questionnaire was used as a screening question that allowed for the possible exclusion of parents who felt that their child did not need their help in mathematics in order to perform well in selected analyses. Item 19 related only to homework involvement and therefore these students were only excluded in the analyses for parental involvement in homework. Since all other composite variables for parental involvement have several other dimensions that would apply to these students, it was appropriate to include them in all of those analyses. Percentages of parents who are never, rarely, sometimes, often, and most often involved were also calculated.

Research question 2 seeks to understand the relationship between parental involvement in children's academic achievement in general, as well as in their mathematics achievement. No student who returned a questionnaire was excluded in these analyses. Grade point averages (GPA) were used as the dependent variable for general achievement. Mathematics grades and CRCT mathematics scores were the dependent variables for mathematics achievement. The third research question was developed to understand what are middle grades parents' beliefs attitudes and expectations about mathematics. Descriptive statistics, means and standard deviations were used to understand parents' beliefs and attitudes about the importance of mathematics, expectations about their children's mathematics performance, and their self-efficacy beliefs regarding their ability to contribute to their children's success in mathematics.

The fourth research question was developed to understand how parents' beliefs, expectations, and self-efficacy variables (indirect involvement variables) correlate with parental involvement in their children's mathematics homework. Since these had interval scales, a Pearson's correlation analysis was conducted. The relationships among the variables themselves were explored, and multiple regression analyses were conducted to see whether these variables could predict parental involvement in mathematics.

In summary, both descriptive statistics (frequency tables, correlation analyses, crosstabulation tables, and means and standard deviations) and regression analyses were conducted to examine relationships and predictive values of parental involvement in general and in mathematics, and achievement in general—and in particular, achievement in mathematics. Regression analyses were also run to determine the predictability of parents' beliefs and attitudes, expectations and self-efficacy when it comes to parental involvement in mathematics homework. When needed, frequencies were collapsed (divided) into categories of low, middle,

and high for crosstabulation analyses, and to obtain a deeper understanding of the function of the variables in question.

CHAPTER 4

RESULTS

The purpose of this study was to understand the relationship between parental involvement and middle grades students' mathematics achievement. The study incorporated different aspects of parental involvement and their relationships with different measures of middle grades students' mathematics achievement. The data were grouped for analysis into three general sections: (a) parental involvement in general, and (b) parental involvement in mathematics, and (c) indirect parental involvement. The aspects of parental involvement in general included parent-child discussion, home structure, parents' educational expectations for their children's education, parental communication with teachers, and parental involvement in homework. Parental involvement in mathematics included parental involvement in mathematics homework and parents' communication with the mathematics teacher. Indirect parental involvement in mathematics included parents' expectations for their children's success in mathematics, parents' self efficacy for helping their children succeed in mathematics, and parents' beliefs and attitudes about mathematics.

Four research questions guided this study:

1. What is the extent of parental involvement in middle school students' homework, especially in mathematics?

    (1a) What percentage of parents is involved in children's homework, in general?

    (1b) What percentage of parents is involved specifically in children's mathematics homework?

2. What is the relationship between parental involvement in general and children's achievement, especially in mathematics?

(2a) What is the relationship between parental involvement in general and children's general achievement?

(2b) What is the relationship between parental involvement in general and children's mathematics achievement?

(2c) What is the relationship between parental involvement in mathematics and children's mathematics achievement?

3. What are middle school parents' beliefs, expectations, and self-efficacy about mathematics?

(3a) What are parental beliefs about the importance of mathematics?

(3b) What are parental expectations about their children's performance in mathematics?

(3c) What is parents' perception about their self-efficacy for middle school mathematics?

4. What is the relationship between parents' beliefs, expectations, and self-efficacy about mathematics and their involvement in their children's mathematics homework?

(4a) What is the relationship between parents' beliefs about the importance of mathematics and their involvement in mathematics homework?

(4b) What is the relationship between parents' expectations about their children's performance in mathematics and their involvement in mathematics homework?

(4c) What is the relationship between parents' self-efficacy for helping their children succeed in mathematics and their involvement in mathematics homework?

(4d) Are parents' self-efficacy about their ability to help their children in mathematics, their expectations, and their beliefs and attitudes significant predictors of parental involvement in mathematics homework?

The intended population for this study consisted of three interdisciplinary teams with a total of 298 seventh grade students. One of the teams consisting of two high achieving and two regular classes, was unresponsive and was consequently switched with a magnet team, changing the total intended population to 293. This switch in fact, turned out to be beneficial to the study, since the magnet students are generally high achieving students and would offer a wider spectrum of achievement levels to the study. However, the new sample composite included a greater proportion of high achieving students, and therefore should be considered in this sense when interpreting the findings of this study.

Demographic Information for students is found in Table 3. The special education students who rotated with the regular classes were included because the special education chairperson determined that they were all able to perform at the regular classroom level. Parents of ESOL students who were identified by teachers and the students themselves as not being able to speak

Table 3

Demographics of Students

Variable	N	%	
Program			
ESOL	4	2.2	
Special Education	5	2.7	
Regular Education	105	57.1	
Magnet	70	38.0	
Gender			
Female	114	62.0	
Male	70	38.0	
Ethnicity			
African American	105	57.1	(school 54%)
Caucasian	41	22.3	(school 27%)
Hispanic	11	6.0	(school 9%)
Asian	21	11.4	(school 9%)
Other	6	3.3	(school 1%)

ESOL (n = 4) students who returned the questionnaire incomplete were excluded.
All Special Education students with completed questionnaires were included.

English were excluded. One hundred and eighty-four students and their parents participated in the study, a response rate of 63%. Demographic information for parents is found Table 4.

Table 4

Demographics of Parents/Guardians

Variable	N	%
Relationship to Student		
Mother	136	74.3
Father	40	21.9
Grandmother	4	2.2
Legal Guardian	3	1.6
Other	1	0.0
Gender		
Female	142	62.0
Male	41	38.0
No Response	1	0.0
Guardian Most Involved		
Yes	177	97.3
No	5	2.7
Education		
Below high school	8	4.4
Completed high school	24	13.3
1 – 2 years of college	53	29.3
4 year college degree	45	24.9
Post graduate degree	51	28.2
No Response	3	0.2
Employment Status		
Not working	12	6.5
Working part-time	27	14.7
Working full-time	145	78.8

N = 184

Variables

For all composite variables, the ratings for each of their dimensions (variables that make up the composite variable) were averaged. For example, the responses for the three questionnaire items about parental involvement in homework in general were added and then divided by three to create that composite variable. In order to have a clear understanding about the distribution of the data in each variable, frequency tables were generated for each of the dependent and independent variables. In order to support questions about relationships between variables, frequencies for composite variables were collapsed into three levels (low, middle, and high), and crosstabulation tables were created for comparison. In some cases, predictive statistics were also computed for questions that involve variables that are likely to predict others. Details for those predictive statistics will be given in subsequent sections of this chapter.

Frequency tables for the dependent variables were generated by dividing the data in the full frequency table as close as statistically possible to thirds, and then using those thirds to create low, middle, and high categories. Full frequency tables (see appendices), and collapsed tables (within text) for dependent and independent variables were created to provide a complete description of the variables.

Dependent Variables

The frequency table for grade point average (GPA) in Appendix C indicates that scores ranged from 1.71 to 4.0. Grade point averages collapsed into thirds are shown in Table 5. An examination of both the full frequency table and the collapsed table indicate that 20 (10.87%) of the students whose GPA fell in the lowest third of this particular group, had lower B averages ranging from (3.0-3.21), and 42 (22.82 %) had C, D, and F averages ranging from 1.71 to 2.99.

Table 5

Grade Point Average Grouped

Category	Frequency	Range of GPA (1-4)	Percent
Low	62	1.71-3.21	33.7
Middle	61	3.29-3.58	33.2
High	61	3.64-4.0	33.2
Total	184		

Frequency tables for mathematics report card grades (Appendix D) show that grades ranged from 51% to 100%. However, it should be noted that scores in the "low" category ranged from 51% to 83%, and that as indicated in the full frequency table, 123 (66.8%) of the students in the sample received an A or a B mathematics grade (above 80%). The collapsed frequency distribution for mathematics grade is shown in Table 6.

Table 6

Mathematics Report Card Grade Grouped

Category	Frequency	Range for Math Grade (%)	Percent
Low	65	51-83	35.3
Middle	58	84-92	31.5
High	61	93-100	33.2
Total	184		

The frequency table for CRCT mathematics scores shows that scores ranged from 770 to 965 (Appendix C). Of the entire set of students who took the CRCT mathematics test, thirty-five (20.2%) did not meet CRCT mathematics standards, 82(47.4%) met the standards, and 56 (32.4%) exceeded standards (n = 173). The collapsed frequency distribution for CRCT

mathematics scores is shown in Table 7. An in-depth examination of Appendix E and Table 7 indicated that of the 58 students whose scores fell in the bottom third for CRCT mathematics scores (770-810), 23 of them met the Georgia Performance Standards (800 - 849). The full frequency table indicated that about 76% of the sample met or exceeded Georgia performance standards for mathematics. If students who did not meet standards (650-799) are considered below average ability, 800-849 average ability, and 850 and above are above average; then the 23 students who fell in the bottom third of this sample were average students. Fourteen students who performed above average (exceeded standards) on the CRCT test fell in the middle category for CRCT performance in mathematics. Means and standard deviations for the achievement variables (i.e. GPA, CRCT mathematics score, and mathematics report card grade) are shown in Table 8. The mean score for GPA is 3.35 (SD = .55), for CRCT mathematics score 838.92 (SD = 44.46), and for mathematics grade 86.96% (SD = 8.93.

Table 7

CRCT Mathematics Scores Grouped

	Frequency	Range for CRCT Score	Percent
Low	58	770-810	33.5
Middle	59	813-852	34.1
High	56	856-965	32.4
Total	184		

Table 8

Descriptive Statistics for Students' Achievement

Variable	M	SD	Min	Max	N
GPA	3.35	0.55	1.71	4.00	184
CRCT Math	838.92	44.46	770	965	173

Math Grade	86.96	8.93	51.00	100	183

A correlation matrix was also computed using raw scores for the three achievement variables GPA, mathematics report card grades, and CRCT mathematics scores. The correlation revealed that each of the achievement measures has a significantly positive relationship with the other two measures. The correlation coefficients are shown in Table 9.

Table 9

Pearson Product-Moment Correlations for Achievement Variables

Variable	GPA	Math Grade	CRCT math
GPA	----	.81**	.64*
Math Grade		----	.71**

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

The following sections in this chapter detail the specific analyses completed to answer each research question and the results of these analyses.

Parental Involvement in Homework

Three questionnaire items were averaged to create the variable for parental involvement in homework in general: parental involvement in tutoring or assisting with homework; checking/reviewing, and correcting homework; and enforcing rules about homework. Four questionnaire items were averaged to create the variable parental involvement in mathematics homework: parents' tutoring and assisting in mathematics homework, ensuring that children understand mathematics homework, working with children on additional mathematics practice skill building, and checking mathematics homework for thoroughness and completion.

The full frequency tables for parental involvement in homework in general (Appendix F), and parental involvement in mathematics homework (Appendix G) were collapsed in three groups of low, middle and high involvement. Table 8 displays the collapsed frequency for

parental involvement in homework in general and Table 9 displays the collapsed frequency for parental involvement in mathematics homework. These tables were created to examine the percentages of parents who are involved in both types of homework, and the levels of their involvement.

The collapsed table for parental involvement in homework in general (Table 10) shows that a large percentage of the parents in this sample fell in the middle category (n =86, 46.7%) of involvement in homework in general. It should be noted that these results are a consequence of collapsing the frequencies into thirds, and that each category is labeled low, middle, and high based solely on parents' self-ratings within this group. The ranges, percents, and means of parents' ratings are shown below in Table 10.

Table 10

Parental Involvement in Homework in General Grouped

	Frequency	Range of Ratings	Percent	Mean Rating
Low	45	1.33-3.0	24.6	1.92
Middle	86	3.33-4.0	47.0	3.09
High	52	4.3-5.0	28.4	4.30
Total	183			

The collapsed table for parental involvement in mathematics homework is shown in (Table 11). By examining the collapsed tables for parental involvement in homework in general, and parental involvement in mathematics homework, it was observed that more parents (28, 15.2% more) fell into the low category of involvement in mathematics homework, compared to the low category for involvement in homework in general. Also, a greater percentage of parents

who are involved in homework in general (46.7%) fell in the middle category, compared to that of involvement in mathematics homework (34.2%). Parents tend to be more involved at the middle and high levels of parental involvement in general (75%), compared to the middle and high levels of parental involvement in mathematics combined (60.3%). It must be noted that these results are a consequence of dividing the frequencies into thirds, and that each category is labeled low, middle, and high based solely on performance within this group. For this group, a considerable number of parents were involved at the middle or high levels both in mathematics homework, and in homework in general. However, parental involvement decreased when it comes to parental involvement in mathematics homework, compared to parental involvement in homework in general.

Table 11

Parental Involvement in Mathematics Homework Grouped

	Frequency	Range of Ratings	Percent
Low	73	1.0-2.5	39.7
Middle	63	2.75-3.5	34.2
High	48	3.75-5.0	26.1
Total	184		

Means and standard deviations (Table 12) were also calculated to determine the level of parental involvement in their child's mathematics homework and homework in general. These calculations excluded 110 (60%) participants who answered "yes" to the following item: "My 7th grader does well in mathematics and does not need my help." This analysis therefore only included 57 students who answered "no" and had completed all the questions that were averaged

to make the composite variable for parental involvement in mathematics homework. Means and standard deviations were calculated to find the average response to parental involvement in homework in general, and parental involvement in mathematics homework. The means were computed by taking the average of all parents responses (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always) to the composite variables parental involvement in homework in general, and parental involvement in mathematics homework. The means and standard deviation for homework in general (M = 3.61, SD = .78) indicate that on a scale of 1 to 5, the average parent was somewhat often involved in homework in general. Regarding parents' involvement in mathematics homework, means and standard deviations (M = 3.37, SD = 0.86) indicate that parents are slightly less involved with mathematics homework than with homework in general. However, caution should be taken in the interpretation of this finding, since only the 57 parents who thought that their children needed help in mathematics were included in the analysis. Therefore, this finding applies only to the parents who felt that their children needed help in mathematics homework in this particular sample and is therefore not applicable to the entire group.

Table 12

Descriptive Statistics for Parental Involvement with Homework in General and Homework in Mathematics

Variable	M	SD	Min.	Max.	N
Parental Involvement with Homework in General	3.61	0.78	1.33	5.00	183
Parental Involvement with Math Homework	3.37	0.86	1.50	5.00	57

Parental Involvement in Aspects of Homework in General

The means of responses to questions that were developed to understand parents' perceptions of their behavior when it comes to homework were used to create the composite variables for parental involvement in homework in general, and involvement in mathematics homework. Analyses were computed to determine the level of parental involvement in each aspect of homework in general, and for involvement in mathematics homework.

The three items that make up the composite for parental involvement in homework in general were examined individually, in order to understand the percentage of parents who are involved in each aspect of parental involvement in homework in general (Table 13). Parents' level of involvement according to their response to each question was placed into one of three sequential levels: (a) never to rarely, (b) sometimes, and (c) often to very often. For each aspect of homework involvement in general, frequencies and percents were calculated from the parents' responses. An overall mean of numbers and percents for each aspect of parental involvement in homework in general was computed for each level (never to rarely, sometimes, and often to very often). The percents in Table 13 include the responses of all parents including those parents who indicated that their children do well in mathematics and do not need their help. These students were included in the computation for parental involvement in mathematics homework because assisting/tutoring in mathematics homework is only one of four aspects of homework involvement in mathematics. These students were included in order to obtain a more accurate overall assessment of the composite variable for involvement in mathematics homework, as well as homework in general. The overall mean for aspects of parental involvement in homework in general was calculated by all the percents and frequency for parents who are never or rarely involved, sometimes involved, and often to very often involved.

Regarding parental involvement in homework in general, the data in Table 13 revealed that the most popular form of homework involvement is enforcing family rules about homework. Assisting/tutoring and checking homework occurred at a similar rate. It is important to note that only 17% of parents never assist or tutor homework in general. The means of the percentages of parents that fell in each category (low, middle, and high) when it comes to parental involvement in homework in general are found in the last row of Table 13.

Table 13

Percentage of Parents Involved with Aspects of Homework in General

Variables	Rarely to Never	Sometimes	Often to Very Often
Assist/tutor with homework in general	33 (17.9%)	79 (42.9%)	72 (39.3%)
How often check/correct HW	53 (29%)	63 (34.1%)	68 (37%)
Family rules about HW enforced	6 (3.3%)	11 (6%)	166 (90.2%)
Mean percents for levels of involvement in homework in general	30.7 (16.7%)	51 (27.7%)	102 (55.4%)

N = 184

Parental Involvement in Aspects of Mathematics Homework

The percent calculations of parents involved in children's mathematics homework (Table 14) include all the students in the sample. Students whose parents think their children do not need their help in mathematics homework are included in the analyses. These students were not excluded because their responses to that question only affect one dimension of the composite variable "assisting with homework." There are three other dimensions that make up the composite variable "parental involvement in mathematics homework," and these students needed

to be included in the computations for the other three dimensions. It is therefore more statistically beneficial to include those students rather than to exclude them.

All four items on the questionnaire that make up the composite for parental involvement in mathematics homework were examined individually to determine the percentage of parents that are involved in each aspect of parental involvement in mathematics homework (Table 14). Parents' level of involvement according to their response to each question was placed into one of three sequential levels: (a) never to rarely, (b) sometimes, and (c) often to very often. An overall mean for numbers and percents for each aspect of parental involvement in mathematics homework was computed for each level of involvement in this table (never to rarely, sometimes, and often to very often).

Table 14

Number and Percentage of Parents Involved with Aspects of Mathematics Homework

Variables	Never to Rarely	Sometimes	Often to Very Often
Assist/tutor with math homework	60 (32.6%)	71 (38.6%)	53 (28.8%)
Ensure that child understands math homework.	28 (15.2%)	45 (24.5%)	111 (60.3%)
Work with child on additional math practice to enhance learning	82 (44.6%)	54 (29.3%)	48 (26.1%)
Inspecting for thoroughness and completion of math homework	60 (32.6%)	64 (34.8%)	59 (32.1%)
Overall means Score	57.5 (31.3%)	58.5 (31.8%)	67.5 (36.7%)

An analysis of frequency of parental involvement in mathematics (Table 14) shows that the most frequent practice of parental involvement in mathematics homework is that of ensuring

that children understand mathematics homework (n = 111, 60.3%). The data show almost one third of the parents in the study never or rarely assist with mathematics homework (n = 60, 32.6%), indicating a decrease of 14.7% in involvement rate in mathematics when compared to involvement in homework in general. Less than one third of the parents (n = 53, 28.8%) frequently (often to very often) assist or tutor in mathematics.

Percent tables that compare parental involvement in homework in general and parental involvement in mathematics homework (Table 15) show that: (a) there are more parents (9.3% more) functioning at the low frequency levels of involvement in mathematics (never to rarely) than for homework in general (21.1%), and less parents (38.8%) functioning at high frequency levels of involvement in mathematics homework (often to very often) when compared to homework in general (53.8%). The percentage of parents who are involved "sometimes" do not vary as much between general involvement (37.2%), and involvement in mathematics (40.4%).

Table 15

Number and Percents of Parental Involvement in Homework

Variables	Rarely to Never Involved (low)	Sometimes Involved (middle)	Often to Very Often Involved (high)
Parental Involvement in Homework in general	17 (9.3%)	68 (37.2%)	98 (53.8)%
Parental Involvement in Math Homework	39 (21.1%)	74 (40.4%)	71 (38.8%)

N = 184

To further examine and compare dimensions of parental involvement in homework in general and parental involvement in mathematics homework, Tables 16 and 17 were developed to display the means and standard deviation for dimensions of each of those variables. An examination of the data in both tables confirmed the notion that parents assisting with

mathematics homework (M = 2.93, SD = 1.169) occurred less frequently than assisting with homework in general (M = 3.27, SD = .987), and that parents reported checking or inspecting both mathematics homework (M = 3.02, SD = 1.216), and homework in general (M = 3.10, SD = 1.046) at fairly similar rates. The tables also show that enforcing family rules for homework is the most popular practice among parents (M = 4.46, SD = .797), and for mathematics, the most popular practice for parents is that of ensuring that their seventh grader understands mathematics homework (M = 3.64, SD = 1.170).

A Pearson's correlation analysis indicated that parental involvement in homework in general has a significant positive relationship with parents' involvement in mathematics homework, $r = .73$, $p < .01$. This suggests that as parental involvement in homework in general increases, parental involvement in mathematics also increases.

Table 16

Descriptive Statistics for Parental Involvement in Homework in General

	Mean	Standard Deviation	Minimum	Maximum
How often help/tutor/ work with HW in general	3.27	.987	1	5
How often review/check/correct homework in general.	3.10	1.046	1	5
Family rules about homework enforced at home.	4.46	.797	1	5

N range = 183-184

Table 17

Descriptive Statistics for Parental Involvement in Mathematics Homework

Variables	Mean	Standard Deviation	Minimum	Maximum
Assist/tutor/work with 7th grader on math homework.	2.93	1.169	1	5
I/We ensure that 7th grader understands math HW.	3.64	1.170	1	5
Work with 7th grader on additional math practice to enhance math.	2.78	1.257	1	5
I inspect my 7thGr's mathematics HW for thoroughness and completion.	3.02	1.216	1	5

N range = 183-184

Parental Involvement and Achievement

Analyses were conducted to examine the relationships between parental involvement in general and achievement in general, as well as achievement in mathematics. Analyses were also conducted to examine relationships between parental involvement in mathematics and mathematics achievement.

Parental Involvement in General and Achievement in General

In order to answer the research question regarding the relationship between parental involvement in general and children's achievement in general (GPA), correlations were calculated for the two variables). The analysis showed that parental involvement in general was not significantly related to GPA, $r = .15$, $p > .05$. Since the p value was only slightly greater than .05 ($p = .051$), full frequency tables for parental involvement in general (Appendix H), and GPA

(Appendix C) collapsed into categories of low, middle, and high (Appendices I and J), were used to create cross tables (Table 18) to further understand the nature of this relationship.

Chi-Square was calculated for the cross tables comparing parental involvement in general with GPA (Table 18). Both the computed Chi-Square and Cramer's V statistics indicated that there was a significant relationship between parental involvement in general and students' grade point average, X^2 (4) = 10.8, $p < .05$; V = .17, $p < .05$. However, an examination of the crosstabulation table pattern shows that the relationship was not linear. The table revealed that a

Table 18

*Parental Involvement in General * Grade Point Average Crosstabulation*

		Parental Involvement in General Grouped			Total
GPA Grouped		Low	Middle	High	
Low	Count	16	18	28	62
	% within parental involvement	27.1%	29.5%	43.8%	33.7%
Middle	Count	25	15	21	61
	% within parental involvement	42.4%	24.6%	32.8%	33.2%
High	Count	18	28	15	61
	% within parental involvement	30.5%	45.9%	23.4%	33.2%
Total	Count	59	61	64	184
	% within parental involvement	100.0%	100.0%	100.0%	100.0%

X^2 (4, N = 184) = 10.80, $p < .05$; V = .17, $p < .05$

significantly high percentage of the students who had high levels of parental involvement in general had low grade point averages (n = 28, 43.8%). However, a significantly high percentage of parents who fell in the middle level of involvement in general had children with high grades (n = 28, 45.9%), and a high percent of students who had low parental involvement in general (n

= 25, 42%), fell in the middle category for grade point average. The results in the crosstabulation table were a consequence of the frequencies of the variables being collapsed into thirds.

Parental Involvement in General and Mathematics Achievement

In order to answer the research question regarding the relationship between parental involvement in general and children's mathematics achievement, a correlation analysis was computed to show the relationships between parental involvement in general and mathematics achievement measured by mathematics report card grade and CRCT mathematics scores. The analysis showed that parental involvement in general was not significantly related to mathematics grades or CRCT mathematics scores, r = -.14, p > .05 and r = -.15, p > .05 respectively. However, parental involvement in mathematics showed a significant negative relationship with mathematics report card grades and CRCT mathematics scores. A more detailed discussion of the latter finding will be provided in a subsequent section of this chapter.

Crosstabulation tables were created to further examine the relationship between parental involvement in general and mathematics achievement. Chi-Square was calculated for the cross tables comparing parental involvement in general with mathematics report card grade (Table 19). Both the computed Chi-Square and Cramer's V statistics indicated that there was a significant relationship between parental involvement in general and students' mathematics grade, X^2 (4, N = 184) = 12.99, p < .05; V = .19, p < .05. However, an examination of the crosstabulation table shows that the relationship was not linear. The table revealed that almost half of the students with high parental involvement in general had low mathematics grades (n = 30, 46.9%), and almost half of the students whose parents are involved at the middle level have high mathematics grades (n = 29, 47.5%). About one third of the students who had low parental involvement in general, had high mathematics grades.

Table 19

*Parental Involvement in General * Mathematics Report Card Grades Crosstabulation*

		Parental Involvement in General Grouped			
Math Grades Grouped		Low	Middle	High	Total
Low	Count	18	17	30	65
	% within parental involvement	30.5%	27.9%	46.9%	35.3%
Middle	Count	21	15	22	58
	% within parental involvement	35.6%	24.6%	34.4%	31.5%
High	Count	20	29	12	61
	% within parental involvement	33.9%	47.5%	18.8%	33.2%
Total	Count	59	61	64	184
	% within parental involvement	100.0%	100.0%	100.0%	100.0%

X^2 (4, N = 184) = 12.99, p < .05; V = .19, p < .05

The second crosstabulation table examined parental involvement in general and CRCT mathematics scores (Table 20). Chi-Square was calculated for the cross tables comparing parental involvement in general with CRCT mathematics scores. Both the computed Chi-Square and Cramer's V statistics indicated that there was not a significant relationship between parental involvement in general and students' mathematics grade, X^2 (4, N = 184) = 8.61, p > .05; V = .15, p >.05. An examination of the crosstabulation table patterns confirms that there was no relationship, linear or otherwise between the parental involvement in general and CRCT mathematics scores. The table revealed that one half of the students with high parental involvement in general had low mathematics grades (n = 32, 50%). However, only about one third of the students with low parental involvement had high grades (n = 21, 35.6%). Twelve of

the 56 students within the high category of CRCT mathematics scores had a high level of parental involvement (n = 12, 18.8%).

Table 20 shows that of those students who fell into the low CRCT mathematics scores category, 50% of them had high parental involvement in general, and 50 (32.2%) of them had low parental involvement. Of the students who fell into the high CRCT mathematics scores

Table 20

*Parental Involvement in General * CRCT Mathematics Scores Crosstabulation*

		Parental Involvement in General Grouped			
CRCT Scores Grouped		Low	Middle	High	Total
Low	Count	19	18	32	69
	% within parental involvement	32.2%	29.5%	50.0%	37.5%
Middle	Count	19	20	20	59
	% within parental involvement	32.2%	32.8%	31.3%	32.1%
High	Count	21	23	12	56
	% within parental involvement	35.6%	37.7%	18.8%	30.4%
Total	Count	59	61	64	184
	% within parental involvement	100.0%	100.0%	100.0%	100.0%

X^2 (4, N = 184) = 8.61, p < .07; V = .15, p < .07

category, only one fifth had high levels of parental involvement (n = 12. 18.8%). However, a significant number of students with high CRCT mathematics scores fell into the middle level of parental involvement in general, and 21 (35.6%) fell into the low involvement category. This finding is similar to that of parental involvement in general and mathematics report grade. More parents fall into the middle to low levels of involvement where high achievers are concerned.

Parental Involvement in Mathematics and Mathematics Achievement

In order to answer the research question regarding the relationship between parental involvement in mathematics and mathematics achievement, a correlation analysis was computed to show the relationships between parental involvement in mathematics and each of the two mathematics achievement measures (mathematics report card grade and CRCT mathematics scores). The analysis showed that parental involvement in mathematics had a significant negative relationship with mathematics report card grades, $r = -24$, $p < .01$, and CRCT mathematics scores, $r = -.30$, $p < .01$. This indicates that as mathematics grades and standardized test scores increase, parental involvement decreases.

Crosstabulation tables were created to further examine the relationship between parental involvement in mathematics and mathematics achievement. The first crosstabulation (Table 21) included parental involvement in mathematics and mathematics report card grade. The table confirmed the significant relationship found in correlation statistics indicating that parental involvement in mathematics has a significant negative relationship with mathematics grades.

Chi-Square was calculated for the cross tables comparing parental involvement in mathematics with mathematics grades (Table 21). Both the computed Chi-Square and Cramer's V statistics indicated that there was a significant negative relationship between parental involvement in general and students' mathematics grades, X^2 (4, N = 184) = 15.05, $p < .01$; V = .29, $p < .01$. The negative relationship can be observed in the crosstabulation table patterns that indicate that almost half of the students with high parental involvement had low grades (n = 35, 47.9%). Almost 50% of students (n = 21, 45.7%) whose parents are involved at the middle level also fell in the middle category for grades, and almost half of the students who had parents with low involvement had high grades (n = 30, 46.2%).

Table 21

*Parental Involvement in Mathematics * Mathematics Report Card Grades Crosstabulation*

MATH Grades Grouped		Parental Involvement in Mathematics Grouped			
		Low	Middle	High	Total
Low	Count	16	14	35	65
	% within parental involvement in mathematics	24.6%	30.4%	47.9%	35.3%
Middle	Count	19	21	18	58
	% within parental involvement in mathematics	29.2%	45.7%	24.7%	31.5%
High	Count	30	11	20	61
	% within parental involvement in mathematics	46.2%	23.9%	27.4%	33.2%
Total	Count	65	46	73	184
	% within parental involvement in mathematics	100.0%	100.0%	100.0%	100.0%

X^2 (4, N = 184) = 15.05, p < .01; V = .29, p < .01

The second crosstabulation table examined parental involvement in mathematics and CRCT mathematics scores (Table 22). A similar relationship was found as in the case with parental involvement in mathematics and mathematics grades. This table also confirmed the significant negative relationship found between parental involvement in mathematics and CRCT scores. Chi-Square was calculated for the cross tables comparing parental involvement in mathematics with mathematics grades. Both the computed Chi-Square and Cramer's V statistics indicated that there was a significant negative relationship between parental involvement in mathematics and students' CRCT mathematics scores, X^2 (4, N = 184) = 20.91, p < .01; V = .24,

$p < .01$. The negative relationship can be observed in the crosstable patterns that indicate that more than half of the students with high parental involvement had low grades (n = 39, 53.4%). Almost 50% of students (n = 30, 46.2%), and a smaller percent of the students who had parents with a middle level of involvement, fell in the middle category for grades.

Table 22

*Parental Involvement in Mathematics * CRCT Mathematics Scores Crosstabulation*

		Parental Involvement in Mathematics grouped			
CRCT Scores Grouped		Low	Middle	High	Total
Low	Count	12	18	39	69
	% within parental involvement in mathematics	18.5%	39.1%	53.4%	37.5%
Middle	Count	23	17	19	59
	% within parental involvement in mathematics	35.4%	37.0%	26.0%	32.1%
High	Count	30	11	15	56
	% within parental involvement in mathematics	46.2%	23.9%	20.5%	30.4%
Total	Count	65	46	73	184
	% within parental involvement in mathematics	100.0%	100.0%	100.0%	100.0%

X^2 (4, N = 184) = 20.91, $p < .01$; V = .24, $p < .01$

Parents' Beliefs and Attitudes about Mathematics

Pearson's correlation (Table 23) was computed to examine the correlation among the dimensions of the composite for beliefs and attitudes. Four dimensions for beliefs and attitudes about mathematics were reverse coded so that the most positive response received a rating of 5

and the least positive response received a rating of 1. The four reverse coded items were: (a) mathematics is not important for society, (b) we do not need mathematics to be successful in life, (c) mathematics ability is inherited, and (d) mathematics is unnecessary. The composite variable for beliefs and attitudes was created by taking the mean of several scaled items (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree). The dimensions for the composite variable "beliefs and attitudes" involved questions that elicited parents' feelings about the importance of mathematics for society, whether or not mathematics is necessary for success in life, the usefulness of mathematics in problem solving, and whether mathematics skills are inherited or can be accomplished by everyone. The correlation matrix in Table 23 shows how variables correlated with each other.

Table 23

Pearson Product-moment Correlations for Parents' Beliefs and Attitude about Mathematics

Variables	Math is not important in Society	We do not need math for success in life	Math develops problem-solving skills	Math ability is inherited	Everyone can do math if they try	Math is really unnecessary
Math is not important in Society	___	.43(**)	.01	.07	.04	.16(*)
We do not need math for success in life		___	-.16(*)	.02	-.15(*)	.28(**)
Math develops problem-solving skills			___	-.12	.26(**)	-.14
Math ability is inherited				___	-.24(**)	.23(**)
Everyone can do math if they try hard enough.					___	-.13

Note. * p < .05. ** p < .01, N range = 180-184

The correlation matrix for parents' beliefs and attitude about mathematics (Table 23) revealed that parents' beliefs that mathematics is not important for society showed a positive significant relationship with their belief that mathematics is not needed in order to be successful in life, $r = .43$, $p < .01$, as well as their belief that math is really unnecessary, $r = .16$, $p < .05$. There were also significant negative relationships between parents beliefs that we do not need mathematics for success in life, with their belief that mathematics is needed for the development of problem solving skills, $r = -.16$, $p < .05$, as well as with their belief that everyone can do math if they try hard enough, $r = -.15$, $p < .05$. However, there was a significant positive relationship between beliefs about the need for mathematics success in life and the necessity of mathematics, $r = .28$, $p < .01$.

Table 23 also shows that parents' belief that mathematics develops problem-solving skills had a high positive correlation with their beliefs that everyone can do mathematics if they try hard enough, $r = .26$, $p < .01$. The table also shows that parents' belief that the ability to do mathematics is inherited has a significant negative relationship with their belief that everyone can do mathematics if they try hard enough, $r = -.24$, $p < .01$, but a significant positive relationship with the belief that mathematics is really unnecessary, $r = .23$, $p < .01$.

The results of the correlation matrix suggest that parents that believed that mathematics is not important for society also tended to believe that mathematics is not needed for success in life, and that mathematics is really unnecessary. However, when parents believed that mathematics is not needed for success in life, they also tend to believe that it is not needed for problem-solving skills. Parents who feel that mathematics ability is inherited, tend to feel that not everyone can do mathematics even if they try hard, and also tend to feel that mathematics is unnecessary.

Table 24 indicates that the mean score for the composite variable for parents' beliefs and attitudes of the importance of mathematics was 2.45 (SD = 0.38). This score on a scale of 1 to 5 where 1 – strongly disagree, 2 = disagree, and 3 = neutral, 4 = agree, and 5 = strongly agree indicates that the average parent disagreed to some extent that mathematics was important and necessary. The range for the composite variable for parents' beliefs and attitude about mathematics on a scale of 1 to 5 where 1 was a low rating and 5 was high, was 2.7.

Table 24

Variable Means and Deviations for Indirect Parental Involvement in Mathematics

Variable	M	SD	Min	Max
Parents' Beliefs and Attitudes on the Importance of Mathematics	2.45	0.38	1.00	3.67
Parents' Expectations about Child's Mathematics Performance	4.38	0.71	1.00	5.00
Parents' Self-Efficacy about Ability to Help Children in Mathematics	3.56	1.01	1.00	5.00

N range = 180 – 184

Parents' Expectations for Children's Mathematics Performance

The dimensions for the composite variable "parents' expectations for children's performance in mathematics" involved two questions that elicited parent feelings about the rigor of mathematics courses that they expect their child to take in high school and beyond, and whether they expect their child to do well in mathematics. A Pearson's correlation computation indicated that the two variables had a significant positive relationship with each other, $r = .49$, $p < .01$. This suggests that the higher the parents' expectations for their children's performance in mathematics, the greater the tendency for parents to expect them to take advanced mathematics courses in high school and beyond.

Means and standard deviations (Table 24) were also calculated to determine the level of parents' expectations about their children's performance in mathematics. The means were calculated by taking the averages of two scaled items (expectations for mathematics performance and expectations for child taking advances mathematics courses). The mean score for the parents' expectations about their children's performance in mathematics (M =4.38, SD = 0.71) indicates that the average parent agreed that they had high expectations about their children's performance in mathematics and choice of advanced mathematics classes in high school and college.

Parents' Self-Efficacy for Mathematics

The dimensions for the composite variable "parents' self-efficacy about mathematics" included three questions that elicited parents' feelings about their ability to help their children perform in mathematics, their ability to teach the seventh grade mathematics curriculum, and their proficiency at mathematics in general. The correlation matrix in Table 25 shows how these dimensions correlated with each other.

The correlation matrix shown in Table 25 indicates that parents' self-efficacy for their ability to help their children to succeed in mathematics had a significant positive relationship with their belief that they are able to teach the seventh grade mathematics curriculum, $r = .62$, $p < .01$, and their feelings about their ability to do mathematics, $r = -.60$, $p < .01$. Parents feelings about their mathematics proficiency also had a significant positive relationship with their feelings about their ability to teach the seventh grade curriculum, $r = .70$, $p < .01$. The mean for parents' self efficacy for helping children succeed in mathematics (M = 3.56, SD = 1.01), indicates that parents tend to feel that they are somewhat able, but not very able to help their children succeed in mathematics.

Table 25

Pearson Product-moment Correlation for Parents' Self-Efficacy for Children's Success in Mathematics

Variables	Parents confidence about their ability to help child succeed in math.	Parents confidence in their ability to teach the 7th grade math curriculum	Parents' feelings about their math proficiency
Parents confidence about their ability to help child succeed in math.	___	.64**	.60**
Parents confidence in their ability to teach the 7th grade math curriculum		___	.70**

Note. * p< .05. ** p < .01, N range = 180 - 184

The correlation results for the variables that represent parents' sense of efficacy for their ability to help their children succeed in mathematics suggests that parents who feel confident about their ability to help their children succeed in mathematics tend to feel that they are proficient in mathematics, and that they are able to teach the seventh grade mathematics curriculum.

Means and standard deviations were calculated to examine the level of parents' self-efficacy about their ability to help their children succeed in mathematics. Means and standard deviations were obtained for the self-efficacy variable that was created from three scaled items combined. The items included questions regarding confidence in ability to help the child with mathematics, teaching of the seventh grade curriculum, and feelings about their own mathematics skills/proficiency. The mean score for the parents' self-efficacy about their ability to help their children succeed in mathematics was 3.56 (SD = 1.01).

The overall findings for parents' disposition for the three indirect parental involvement factors (expectations, beliefs and attitudes, and self-efficacy) suggested in Table 25 are that

parents had high expectations for their children's mathematics performance, felt that they had some degree of self-efficacy for helping children to be successful in mathematics, but really did not think mathematics is very important.

Parents' Beliefs and Attitude, Expectations, Self-efficacy, and Mathematics Homework.

A correlation matrix (Table 26) was calculated to understand the relationships between three indirect variables (a) parents' beliefs and attitude about mathematics, (b) their expectations for their children's performance in mathematics, and (c) their self-efficacy about helping children succeed in mathematics; and the variable parents' involvement in mathematics homework. The findings are provided in the paragraphs below.

Table 26

Pearson Product-Moment Correlation for Parents' Beliefs, Attitude and Expectations, and Involvement in Mathematics Homework.

Variable	Involvement in Math	Beliefs and Attitudes	Expectations for Math	Self-efficacy for Mathematics
Involvement in Math Homework	---	.03	.05	.42**
Beliefs and Attitudes		---	-.17*	.02
Expectations			---	.14
Self-Efficacy				---

Note. * $p < .05$, ** $p < .01$, N ranges from 180 - 184

The correlation indicated that there was not a significant relationship between parents beliefs and attitude about mathematics, and parental involvement in mathematics homework, $r = .03$, $p > .05$. This indicated that for the parents in this sample, beliefs and attitudes about mathematics did not tend to matter when it comes to their involvement in mathematics homework. There was not a significant relationship between parents' expectations about their

children's performance in mathematics and their involvement in mathematics homework, $r = .05$, $p > .05$. This suggests that the level of parents' expectations for children's mathematics performance may not be reflected in the level of parental involvement in mathematics homework. However, the correlation matrix in Table 26 indicated that there was a significant positive relationship between parents' self-efficacy for helping their children succeed in mathematics and their involvement in mathematics homework, $r = .42$, $p < .01$. This finding suggests that parents' involvement in mathematics homework tends to increase with increasing levels of self-efficacy for helping children in mathematics homework. It was also found that parents' expectations for their children's performance in mathematics has a significant negative relationship with parents beliefs and attitudes about mathematics, $r = -.17$, $p < .05$. This indicates to a fairly significant degree, that the more negative the parents' beliefs and attitudes are about mathematics, the greater their involvement in mathematics homework. The latter finding was unexpected, and will be discussed in more detail in Chapter 5.

Overall, the findings for the relationship of parents' beliefs, expectations, and self-efficacy with their involvement in mathematics homework suggest that although parents tend to have high expectation for their children's performance in mathematics (M = 4.38, SD = .71). These expectations are not related to their involvement in mathematics homework. Also, parents' beliefs and attitudes about mathematics—which is low for this particular group (M = 2.45, SD = .38) do not appear to be related to their involvement in children's mathematics homework. In addition, it was found that parents' expectations for their children's performance in mathematics tend to have an inverse relationship with their involvement in children's mathematics homework. However, parents' sense of efficacy (self-efficacy) for helping their children succeed in

mathematics (M = 3.56, SD = 1.01), does appear to influence their involvement in mathematics homework.

Beliefs and Attitudes, Expectations, and Self-Efficacy as Predictors of Parental Involvement in Mathematics Homework.

A multiple regression analysis (Table 27) was conducted to determine if parents' beliefs and attitudes about mathematics, parents' expectations for children's mathematics performance, and self-efficacy about their ability to help their children in mathematics were significant predictors of parental involvement in mathematics homework. The variance inflation factors that measure the impact of collinearity among the variables in the regression model reveal that there was no evidence of multicollinearity, VIF = 6.10. The regression coefficients are listed in Table 27. The omnibus regression model (provides a test of the joint predictive ability of all the covariates in the model) was a significant predictor of parental involvement with mathematics homework, F (3, 173) = 11.78, $p < .01$, $R^2 = .17$. The regression coefficients indicated that parents' self-efficacy was a significant positive predictor of involvement in mathematics homework, $\beta = .30$, $p < .01$. This suggests that the greater the parents' sense of efficacy, the greater the tendency of parents to be involved in mathematics homework. Expectations and beliefs and attitudes were not significant predictors in this model. However, while statistically significant, the independent variables in this model (beliefs and attitudes, expectations, and self-efficacy) explains only a small degree (17%) of the variance in the dependent variable (involvement in mathematics homework), $R^2 = .17$.

The results of the regression analysis in Table 27 were triangulated by both selecting only the magnet students for the regression analyses, and then excluding them from the analysis. This was accomplished by using the "select cases" feature in SPSS statistics program. In both cases,

the findings for the predictability for parents' beliefs and attitudes, expectations, and self-efficacy about mathematics for parental involvement in mathematics homework remained unchanged. Parents' beliefs and attitudes, and expectations were not predictors of parental involvement in mathematics homework. However, parents' self-efficacy was a significant predictor of parental involvement in mathematics homework. Therefore, in an effort to examine the predictability of self-efficacy on parental involvement in mathematics homework, a simple linear regression was calculated to predict parental involvement with mathematics homework based on parents' self-efficacy. A significant regression equation was found ($F (1, 179) = 37.370$, $p < .001$, with $R^2 = .17$. The result of the second regression model had a much stronger positive significance than the first. The R^2 result in the second regression model indicates that parents' self-efficacy for mathematics accounts for 17% of the variability in their involvement in homework.

Table 27

Regression Coefficients for Parental Involvement in Mathematics Homework

Predictors	B	SE	β	T	Sig.
Expectations	-0.06	0.07	-0.06	-0.90	.371
Beliefs and Attitude	0.07	0.14	0.04	0.54	.587
Self-efficacy for math	0.30	0.05	0.41	5.88	.000

N range = 180-184, $R^2 = .17$

CHAPTER 5

SUMMARY AND CONCLUSIONS

Many researchers have explored the role of parental involvement in children's academic achievement. These researchers have focused on different levels of education for a range of different content areas. It has been established that there is a relationship between parental involvement and academic achievement (Desimone, 1999; Henderson & Mapp, 2002), and mathematics achievement (Keith & Keith, 1993; Sheldon & Epstein, 2005; Wang & Wildman, 1996). The quantitative methodologies such as the one used in this study tend to be descriptive and are not intended to provide answers as to whether or not parental involvement increases academic achievement. Descriptive non-experimental methodology tends to be the method of choice to gather data, analyze, and disseminate information about the role of parental involvement in children's education. This has helped to show how different aspects of parental involvement relate to various measures of academic achievement. In the current study, I found it appropriate to specifically examine relationships between types of parental involvement and children's' academic achievement using parents' perception of their involvement behaviors through survey research.

The objectives of the study were to: (a) provide a descriptive assessment of the extent of parental involvement in mathematics homework and homework in general; (b) understand the relationship between parental involvement in general and achievement in general, as well as in mathematics achievement; and (c) understand the relationship between parental involvement in mathematics and mathematics achievement. Additional objectives of this study were to understand parents' beliefs and attitudes, expectations, and self-efficacy about mathematics, as

well as to understand the relationship between these factors and parents' involvement in their children's mathematics homework.

Context of the Study

When drawing conclusions from the study, it is important to consider the context under which the study was conducted. The sample was drawn from a population of students in a high-performing middle school serving a majority population of African Americans. The school has a magnet component where a notable portion of the students (38.04%), were enrolled in the magnet program. The school population consisted of 54% African Americans, 27% Caucasians, 9.0% Hispanics, 9.0% Asians, and 3.3% came from other ethnic backgrounds. The magnet students are drawn from a group of high achieving students, and therefore, the composition of this group would include a higher percentage of high achieving mathematics students than the average middle school.

According to the CRCT criterion, of the 173 students in the sample who took the Georgia CRCT in year 2007, 20.2% fell below expectations (statewide 26%), 39.3% met expectations (statewide 53%), and 40.5% exceeded expectations (statewide 21%). This shows that 79.8% of the 173 students in the sample met or exceeded State performance standards for mathematics, compared with the 74% of students statewide that meet or exceed performance standards. However, it should be noted that there is a significant difference between the percentage of those that exceeded standards at this school (40.5%) compared to the state of Georgia overall (21%). Although the findings of this study are particular to this school, the overall performance was close enough to the State's performance to apply some degree of generalizability regarding the relationship of parental involvement to mathematics achievement based on CRCT mathematics scores. Since mathematics grades are more subjective, findings for analyses that used

mathematics grades as the dependent variable may only be discussed as they relate to this sample at this particular school.

The overall mean for the grade point averages of the students in the sample was 3.35 (SD=.55). The school's mean performance in the CRCT mathematics test was 811, and the sample mean score was 839, both meeting state performance standards (800-849). The scores indicate a small bias towards high scoring students in this sample. However, the difference in both the mean score of this sample and that of the school's did not compromise the findings of this study. Both mean scores fell in the "meet expectations" category.

The findings of this study do not imply cause and effect, but provide an insight into the extent that parents are involved in the different aspects of their children's mathematics homework, and homework in general. Findings also explain the relationships between parental involvement and two measures of mathematics achievement (mathematics grades, and CRCT mathematics scores), as well as achievement in general (GPA).

Overall, a large percentage of the parents (90.2%) in the study set rules for doing homework in general—a finding similar to Catsambis (1998) who found a similar practice among middle grades parents in her study. Parents in this study are as involved in mathematics homework as they are in other homework, but there are differences in the way they are involved in mathematics homework compared to homework in general. One factor that appears to influence the way parents are involved in mathematics homework is parents' feelings about how effective their involvement would be for their children's' academic progress. The average parent in this study felt that they are somewhat able to help their children succeed in mathematics and this may partially explain why parents' help with mathematics homework was less than their help with homework in general. However, well over half of the parents (60.3%) reported that

they consistently take measures to ensure that their children understand their mathematics homework, but less frequently check for thoroughness and completion.

The findings from the correlation analysis discussed in Chapter 4 suggest that parental involvement increases as mathematics grades decrease, or that as mathematics grades increase, parental involvement decreases. Correlation analysis also shows that parents' beliefs about their self efficacy for helping their children succeed in mathematics was related to their involvement in mathematics homework. The findings as they pertain to the research questions are discussed in the sections below.

Level of Parental Involvement in Homework

One objective of this study was to find the percentage of parents that is involved in their children's homework in general, and specifically in mathematics homework. The results of the descriptive analysis that addressed this question (Table 16*, p. 83*) show that the most frequent parental involvement practice regarding homework in general is that parents (90.2%) set rules for doing homework often or very often. Approximately 39.1% of parents tutor or assist their children with homework often or very often, and 17.9% rarely or never tutor or assist. In terms of checking/correcting homework, 37% of parents chose often or very often to rank their participation, and 28.8% of them said that they never or rarely check or correct homework. These finding*s* suggest that parents believe that setting rules for doing homework plays a significant role in their children's academic advancement. However, they less often tutor their children, or even check or correct homework. Further research is needed to understand parents' specific views and reason*s* for tutoring or not tutoring, and checking or not checking homework. In addition, a very large percentage of parents chose to set rules for doing homework. The question as to whether they engage in this behavior because they believe this would increase

their children's academic achievement, or because they are obligated as parents to set rules for homework, could be answered by future researchers with an interest in expanding the findings in this study.

The mean of the Likert scaled items for parental involvement in homework in general was 3.61 (SD= 0.7), suggesting that involvement in homework overall was somewhere between "sometimes" and "often." This level of involvement in homework in general could be considered reasonable, even while considering differences in parents' view of what is considered "sometimes" and "often."

It may be, that as Christenson, Rounds and Gorney (1992), and other researchers have suggested, parents feel that at the middle school level, their children are at the stage where they are able to manage their homework without parents' help. They could also feel that this is the time to allow students to develop independence by being in control of certain aspects of their own lives (Erickson, 1963; 1983). Since the data from the study also shows that as children's mathematics grades and CRCT scores increase, parental involvement in mathematics decreases (Table 24, *p. 94*), parents' ratings of their involvement may reflect where the students are in the learning curve for general achievement or mathematics achievement at the time the data was collected. The data from this study suggest that parents may see a need to become more involved, and then become more involved when either grades or test scores in mathematics decrease.

Parental Involvement in Mathematics Homework

The overall findings for percentage of parental involvement in mathematics homework are that 31.3% of parents are rarely or never involved in mathematics homework, 31.8% are sometimes involved, and 36.7% are often or very often involved (Table 17*, p. 84*). The results in

this study show that the most frequent practice for parental involvement in mathematics homework is that of ensuring understanding of mathematics homework (60.3%). While, this study does not provide data on exactly how parents check for understanding, it does suggest that parents participate to some extent in children's mathematics content learning at home. The data shows that 32.6% never or rarely tutor or assist with mathematics homework, compared to 47% who tutor or assist with homework in general.

The data on percentage of parents checking their children for understanding mathematics homework showed that 60.3% of parents check often or very often. This is the most common form of involvement in mathematics homework by parents. The way that parents check for children's understanding of mathematics homework was not a focus of this study, and therefore there were no findings for this phenomenon. Only 28.8% of parents tutor or assist with children's mathematics homework often or very often, and 36.8% indicate that they tutor or assist sometimes. This could suggest that the children of those parents who tutor or assist sometimes, are more capable than the children of parents who tutor or assist often or very often, and that those parents who rarely or never tutor or assist, are the parents of children who have the strongest mathematics skills. Further research would be needed to clarify this question about the relationship between children's mathematics skills (that is whether or not they struggle with mathematics) and their parents involvement with tutoring and assisting them in mathematics.

This phenomenon could be explained by the findings about parents' level of self-efficacy about helping their children succeed in mathematics (Table 17, p. 84). Hoover-Dempsey and Sandler (1997) indicated that one explanation for why parents become involved in children's education is their sense of efficacy. If parents feel that they will make a difference, they tend to become more involved. The data in this study suggest that the average parent rated themselves

between “neutral and agree” (mean =3.56) in terms of their feelings about their efficacy for helping their children in mathematics. This may explain why more parents are not very often involved. There is also the issue that as the mathematics curriculum becomes more difficult in the middle grades, parents may not always feel prepared to provide the kind of assistance that their children need in terms of the mathematics content, thus decreasing their involvement (Eccles & Harold, 1991; Haycock and Ames, 2000; Shumow & Miller, 2001).

Findings in this study show that parental involvement in mathematics has a significant negative relationship with mathematics achievement. Using data from the Longitudinal Study of American Youth (LSAY), Shumow and Miller (2001) also found a negative relationship between parental involvement at home and students’ academic achievement. However, Shumow’s and Miller’s (2001) study did not focus specifically on parents’ mathematics involvement. The study reported here is distinguished from others that focus on parental involvement in general. The statistical analysis revealed that almost half (44%) of parents never or rarely do additional mathematics practice with their children, and 29.3% sometimes do additional practice. Working with children on additional practice for mathematics was not a popular choice of parental involvement in mathematics by the parents in this sample.

Overall, findings suggest that for the most part, parents feel that simply completing mathematics homework on their own is enough to enable their children to at least have a reasonable measure of success in mathematics. However, they did indicate that they very frequently enforce family rules about homework in general, that they take steps to ensure that the*ir* children understand mathematics homework frequently, and that they check children’s mathematics homework for completion and thoroughness fairly often.

The mean score for parental involvement in mathematics homework was 3.37 (SD = 0.86). This score indicates that the average parent's involvement with mathematics homework was between the levels of "sometimes" and "often." Results show that overall, the extent of parental involvement in mathematics homework is similar to involvement in general.

The decrease in the percentage of parents involved in assisting and tutoring mathematics homework compared to homework in general (mentioned earlier) may suggest that parents are tutoring more in other subject areas than in mathematics. A relative comparison could be made between checking and correcting homework in general, and checking for thoroughness and completion of mathematics homework. Thirty seven percent (37%) of parents frequently check or correct homework in general, with 34.2% checking sometimes, and 32.1% of parents frequently checking their children's mathematics homework for thoroughness and completion, with 34.8% checking sometimes. The data suggest that parents frequently check children's mathematics homework and homework in general at approximately the same rate, but are less involved in the aspect of assisting with and tutoring mathematics.

Involvement in General and Achievement

Question 2 of this study focused on the relationship between parental involvement in general, and how it relates to academic achievement as well as mathematics achievement. It also addressed parental involvement in mathematics and its relationship with mathematics achievement. The findings provided in Chapter 4 indicate that the relationship between parental involvement in general, and general achievement measured by grade point average, was not significant for this group of students ($r = -.15$, $p > .05$). Chi-Square in crosstabulation tables indicates that there is a significant but not linear relationship between parental involvement in general and GPA, suggesting parental involvement is somewhat reflected in GPA but not to the

extent where a consistent positive or negative linear pattern could be observed. It is also important to note that in terms of performance by ethnicity, although Asian American students had the highest mean score on GPA, Caucasian students performed higher on the CRCT mathematics portion than African American and Asian American students. The Hispanic students had the lowest CRCT mathematics scores among all the ethnic groups, but had mathematics grades that were similar to African American students. The implication here is that parents of students who were performing well were less involved, and this could explain the different parental involvement levels among parents of students with different ethnicity. However, the small number of students from Hispanic and Asian backgrounds in this sample was not significant enough to generalize the means performance of those ethnic groups to that of a wider population.

Parental involvement in general in this study showed no relationship with GPA, mathematics grades, or CRCT scores. This outcome is unexpected, since the findings of previous research have indicated that parental involvement is significantly related to achievement. However, the factors that constitute "parental involvement" in the body of literature included varying aspects of involvement, and some included a wider scope of involvement than the present study. For example, Epstein (2001b) included involvement activities within the school and community, while Sui-Chu and Willms (1996) focused on home and school involvement. Also, Henderson and Mapp, (2002) included in their review, studies that cover various aspects of involvement. For the purposes of the present study, parental involvement at school and in the community was considered more distantly related to academics than parental involvement at home, and so was not included. The focus of the study reported here was to consider what parents were doing in terms of academic involvement in children's education, and therefore

incorporated such aspects as involvement in homework, home-school communication with teachers, home structure that supports academic performance, and parents' expectations for children's performance.

The finding of no relationship between parental involvement in general and achievement in mathematics, could suggest that mathematics achievement may not be the best measure for general parental involvement activities that is not specifically related to the learning of mathematics content. Also, this could suggest that the various aspects of involvement such as school and community involvement that have been studied by other researchers, should be examined separately for their effects on academic achievement, as well as achievement in specific content areas. In this study, findings show that there was a significant negative relationship between parental involvement in mathematics and mathematics grades. Since parents are likely to become involved in different aspects of parental involvement as well as in different subject areas, it is important to explore the relationships between aspects of parental involvement and their relationship with different academic measures.

Future research that focuses more specifically on parental involvement at home should provide valuable information. For example, findings about parental involvement in homework having no relationship with academic achievement could also be affected by the quality/type of homework given, whether homework is given as busy work, or whether it involves the deeper concepts being taught. Van Voorhis (2003) suggested that some researchers (*e.g.,* Kralovec & Buell, 2001) think that homework should be abandoned, but that schools believe that homework has a positive effect on academic achievement. She suggested that homework should be improved. This draws into significance the teacher's role in designing homework.

This finding that parental involvement in homework did not have a positive significant relationship with achievement, although not what many educators would like to hear, is not unique. The findings in parental involvement research often vary because of the differences in the dimensions of the composite variable "parental involvement." However, Shumow and Miller (2001) found a negative relationship between parental involvement at home and academic achievement. Their composite variable for parental involvement at home included parental participation in academic activities such as assisting with mathematics, writing, special projects, and helping with homework. Their composite variable consisted of specific academic activities at home, similar to the composite variable in this study. The three dimensions of Shumow*'s* and Miller's variable parental involvement at home are about parents assisting with, supporting, and enhancing children's academic performance. The composite for home involvement in this study involves tutoring and assisting with homework, communicating with teachers, reviewing/checking/correcting homework, parents' expectations, and family rules about homework. The variables in this study were more general, whereas Shumow's and Miller's (2001) variables for home involvement revolved around parents assisting with academic assignments.

It could be deduced that Shumow's and Miller's (2001) finding that parents' home involvement had a significant negative relationship with academic achievement, as well as the significant negative relationship found between parental involvement in mathematics and mathematics achievement in this study, had a common foundation. In both studies, the independent variables had a direct bearing on academic achievement. The finding of no relationship between parental involvement in general and GPA, and mathematics achievement,

could suggest that more specific measures of each dimension of involvement need to be examined.

The intention of this study was to determine the relationship between parental involvement at home and mathematics achievement and with achievement in general. It is reasonable to assume that the average performance of the students in this study may be somewhat higher than seventh graders in other schools because students in the magnet program were included in the sample (38%). The magnet students' grade-point averages had a mean of 3.66, which is higher than the mean of other students in this sample (mean=3.13).

The finding of no significant relationship between parental involvement in general and academic achievement could suggest that these parents might not be as involved as the average parent in other schools, because their children are not having as much difficulty with academic subjects. However, it should be noted that since the composite of parental involvement in general does not only include variables that are directly related to involvement in subject content/curriculum aspects, the latter explanation only partially explain*s* these results.

Involvement in General and Mathematics Achievement

Correlation analysis was completed to determine whether there is a relationship between parental involvement in general, and mathematics achievement measured by mathematics report card grades and CRCT scores (Table 24*, p. 94*). The analysis showed that there was no significant relationship between involvement in general and mathematics achievement measured by CRCT mathematics scores, or mathematics grades. One assumption of this study is that parental involvement in general that is not specific to mathematics may not show a relationship with mathematics achievement since mathematics requires specific skills. The findings from the study support that concept. If any relationship is anticipated, it would be more logical to expect

to find one between parental involvement in general and academic achievement (GPA), than with mathematics achievement. However, in this case, parents' general involvement showed no relationship with any of the three measures of achievement. This might suggest that there may be specific types of parental involvement needed to increase academic achievement in particular subject areas such as mathematics (Sheldon & Epstein, 2005), and science (Van Voorhis, 2000). The composite variable for parental involvement in general as used in this analysis, did not include activities in terms of parents' involvement in mathematics.

Parental Involvement in Mathematics

Parental involvement in mathematics is shown in this study to have a significant negative relationship with mathematics achievement as measured by both mathematics report card grades and CRCT mathematics scores (Table 24*, p. 94*). Most of the arguments presented for the sections above would apply to this section as well. Nonetheless, findings via this model appear to refute the notion that parental involvement in mathematics is likely to increase mathematics achievement. Caution should be taken when viewing this finding, because it could mean that more parental involvement at the lower levels of achievement could have increased mathematics achievement to the point where less involvement is necessary. Therefore this is not to say that parental involvement in mathematics does not have a positive effect on mathematics achievement. Rather, it suggests that when grades are lower, parental involvement is greater but when grades are higher parental involvement decreases.

Balli, Demo and Wedman, (1998) who did an experimental study on 6th graders in which parents were prompted to become involved in mathematics homework, found that the rate of family involvement in mathematics homework did not improve mathematics achievement. However, it did lead to an increase of parental involvement in mathematics homework. This

suggests that high levels of involvement alone may not increase mathematics achievement (as in this case with mathematics homework). Perhaps the way parents are involved in mathematics learning may be the issue here. Hoover-Dempsey et al. (2001) suggested that parents may need to be more prepared, and Van Voorhis (2003) suggested that teachers might need to improve their homework development practices. Both of these ideas could be the factors that would make a difference to the effectiveness of homework. It could also mean that parents' assisting with mathematics homework without having all the necessary skills might serve to confuse or frustrate students who are already struggling in the classroom. Results from interactive parental involvement in particular subject areas indicate that teacher directives to parents about specific activities that foster interactions with students may have better mathematics learning outcomes (Balli, Demo & Wedman, 1998; Van Voorhis, 2003) than the traditional, more general approach to assigning mathematics homework.

The result of this finding is logical in the sense that as children become more skilled at mathematics, parental involvement would be likely to decrease. However, it may also be argued that findings on relationships between parental involvement and achievement would depend on which point on the mathematics learning curve of students the data is collected. On a progressive learning scale, it could be assumed that at the low skills level of the curve, before students acquire mathematics proficiency, parents are more likely to be involved, and at the acquired proficiency end of the learning curve, parents are less likely to be involved. This would reflect a negative relationship in both cases. Therefore, a positive relationship appears unlikely to be shown with parental involvement if viewed from this perspective if data is collected at just one point in time. A limitation of this type of study is that the model does not facilitate the examination of the effects of parental involvement on students' achievement before and after

parents become involved, to determine a cause and effect relationship, nor would any non-experimental model. In reality, it would be difficult or impossible to precisely measure cause and effect of parental involvement on students' academic achievement using an experimental research model because most parents begin their involvement in their children's academic learning before they reach school age. Longitudinal studies may have a greater potential for capturing more precise effects of parental involvement on academic achievement.

If CRCT mathematics scores and mathematics report card grades have a significant negative correlation with parental involvement in mathematics, it is likely that each of these measures would predict levels of parental involvement in children's education. A significant negative correlation between involvement in mathematics and mathematics achievement indicates a negative linear relationship. This finding suggest*s* that knowledge of students' mathematics grades could imply knowledge of parental involvement level in terms of an inverse relationship. Although each variable may predict the other, the question is which comes first. It is logical to assume that mathematics grades precede parental involvement since low grades prompt greater parental involvement. Parental involvement is reactionary to needs for improved grades. To clarify the point, I ask the following question of this inversely predictive relationship: "Would grades decrease if parental involvement increased?" or "Will parental involvement decrease if [grade] grades increase?" Which makes more sense? Clearly, it makes sense to hypothesize that as mathematics grades increase, middle school *parental* involvement in their children's mathematics education might decrease. However, the question of whether parental involvement in children's mathematics education increases mathematics achievement is still for the most part unanswered.

In this study, general parental involvement showed no significant relationship with achievement in general (measured by grade point averages), nor did it show a significant relationship with mathematics achievement (math report card grades, and CRCT mathematics scores). However, parental involvement in mathematics showed a significant negative relationship with measures of mathematics achievement (GPA and CRCT mathematics scores), and had a significant negative predictive value on measures of mathematics achievement. Findings suggest that parents' general involvement may set up a foundation for children to be successful in school. However, it requires more specifically related types of activities to really impact achievement in specific content areas. It appears that the type of involvement chosen by parents may be influenced by various factors that need further clarification.

Parents' Beliefs and Attitudes about Mathematics

Descriptive methods were used in this study to understand parents' beliefs and attitudes about mathematics. The assumption was that parents' beliefs and attitudes about mathematics might influence the way they are involved in their children's mathematics education. Of Hoover-Dempsey's and Sandler's (1997) three psychologically based constructs for why and how parents become involved in their children's education, two of them are based on parents' beliefs. Those two constructs suggest that parents become involved in their children's education according to their sense of efficacy for helping their children succeed, and by their perception of their role in their children's education. It is a plausible assumption that beliefs and attitudes drive what individuals do, the extent to which they engage in those activities, and how those activities are undertaken.

In order to try to make more sense of the results in this study, an understanding about parents' beliefs and attitude about mathematics was thought to be a valuable area of focus. In

order to find out what those beliefs and attitudes about mathematics were, a table of means and standard deviations for the relevant factors was created. This group of questions on the questionnaire sought to assess parents' beliefs about the importance and usefulness of mathematics in order to relate those reported beliefs to parents' involvement in mathematics. The computed results for means and standard deviations for parents' beliefs and attitudes about the importance of mathematics revealed a mean score of 2.45 (SD = 0.38); suggesting parents tend to disagree that mathematics is academically, or practically important. Since parents' expectations could be connected to beliefs and actions, an attempt was made to understand what were parents' expectations for their children's mathematics performance. In the same table of means and standard deviations, parents were shown to have high expectations for their children's performance in mathematics (mean = 4.38; SD = .71), and average self-efficacy for their children's' success in mathematics (mean = 3.56, SD = 1.01).

This group of parents does not agree that mathematics is important, yet they have high expectations for their children's performance in mathematics. Therefore, the question of why then do they have high expectations for their children's mathematics performance arises. Although parents do not believe that mathematics is important, they could have high expectations because they believe that their children have a high aptitude for mathematics, or they know that educational standards are based on mathematics skills. Reaching or exceeding the mathematics and reading standards set by the States in compliance with the No Child Left Behind Act (2001) marks students' proficiency status within the United States. In the school district studied, academic decisions for elementary and middle school students are based on performance in reading and mathematics scores made on the CRCT. Therefore parents are aware of the importance of achieving high scores in mathematics and reading, rather than the

importance of mathematics itself. Parents may also be aware that having high mathematics scores opens a path to more challenging high schools and college courses.

Drummond and Stipek (2004), in their study on low-income elementary parents' beliefs about their role in children's learning, found that parents do not think helping their children with mathematics is as important as helping them with reading. A possible explanation for this is that parents may think that helping children with reading will enable them to achieve academic success in general, whereas mathematics may not. This could also partly explain why parental involvement in helping children with mathematics homework was less than their involvement with homework in general. Consequently, if parents' self-efficacy is not strong for mathematics, they may channel their efforts into other areas (subjects) where they think that they could make more significant contributions to their children's academic success. Parents' high expectations for their children's performance in mathematics could be explained in the sense that parents realize that the educational system places a great emphasis on mathematics performance, and that mathematics is needed for their children to progress successfully through the educational system. This appears to warrant parents' high expectations for their children's performance in mathematics despite their beliefs about the importance of mathematics.

The parents in this study felt that they have some ability to help their children succeed in mathematics. Since their mean rating of 3.56 lies between neutral and agree, this suggests that they may not feel that they have all the skills necessary to help their children succeed in mathematics. Hoover-Dempsey and Sandler (1997) and Shumow and Lomax (2002) suggest that parents' sense of efficacy helps to determine how they participate in their children's' education. Hoover-Dempsey and Sandler highlighted three psychological constructs that determine how and why parents get involved in their children's education (discussed in Chapter 2). They noted that

if parents feel that their involvement would make a difference, they are likely to become involved. Shumow and Lomax (2002), in their attempt to understand parents' efficacy as a predictor of their involvement behavior, found that those parents' efficacy predicted their involvement. Green's and Hoover-Dempsey's (2007) study on home-schooling, indirectly strengthened the idea that parent's self efficacy about their ability to help their children succeed in school, influences the extent of their involvement in their children's education. In the cases of home schooling, parents take on the responsibility of educating their children at home. Although home schooling is not in itself relevant to this study, it does bear out the notion that parents' perception of their self-efficacy may influence how they are involved in their children's education. One implication for this finding is that if parents' sense of efficacy is increased, then more effective parental involvement might occur. Sheldon and Epstein (2005) suggest that attention should be given by schools to preparing parents to become more effective participants in their children's' mathematics education. The idea that parents do realize that children need mathematics to meet educational requirements may be a source of frustration for them if their self-efficacy for helping them is low. If parents' self-efficacy is not strong at the middle grades level, the implication is that they could become less and less helpful to their children in mathematics as they progress through successive grade levels. This, added to adolescents' need to become more independent, may predict significantly less mathematics involvement by parents as children progress through high school.

Question 4a-4c in this study was an attempt to understand the relationship between parents' beliefs about mathematics, parents' expectations about mathematics, parents' sense of efficacy for helping with mathematics, and parents' involvement in mathematics homework. In

other words, the objective was to understand what kinds of correlations—if any, these four factors had among themselves.

A Pearson product-moment correlation analysis (Table 26, *p. 97*) revealed that neither parents' expectations, nor their beliefs and attitudes, showed significant relationships with their involvement in mathematics homework. However, parents' self-efficacy showed a significant positive relationship with their involvement in children's mathematics homework. These findings support findings in the earlier analyses of this study. If parents do not believe mathematics is important, they may not be motivated to become involved in mathematics homework, and finding*s* of this study suggest that belief factors do not predict parents' involvement in homework. However, parents' self-efficacy for helping children with mathematics is shown to be a significant predictor of their involvement in mathematics homework. This finding is clear and expected. If parents do not feel that they are able to effectively help with mathematics homework, then they would be less involved in helping with mathematics homework, but perhaps more involved in making sure that homework is completed, or in other aspects of homework monitoring. As mentioned earlier in this chapter, Hoover-Dempsey and Sandler (1997) noted that sense of efficacy is one of three psychological constructs that determine why and how parents become involved in their children's education. We can therefore assume that if parents feel that they can effectively help their children to succeed in mathematics, they will.

Linking another of Hoover-Dempsey 's and Sandler's three constructs to the current findings about self-efficacy for mathematics could suggest that parents' beliefs about their role in their children mathematics education has an implication for their self-efficacy. Their findings may also be linked to findings in this study that shows a significant negative relationship

between parental involvement in mathematics and mathematics achievement. This could suggest that as parents feel less effective about their involvement in children's mathematics, they might pass on more of the responsibility of their children's education to their mathematics teachers. This suggests that as parents' sense of their role is diminished, so could their involvement. It could also be deduced that as students become more proficient in mathematics, parents begin to relinquish their role in their children's mathematics education and become less involved—a portrayal of the characteristic of a negative relationship. Another interpretation could be that if parents see their role as being actively involved in their children's mathematics education, they might want to become more involved in homework. However, a lack of self-efficacy (sense of efficacy) may cause them to renegotiate their role and hand over the bulk of the responsibility of learning to the students and their mathematics teachers. This could then result in less parental involvement in mathematics homework. This study did not attempt to evaluate parents' beliefs about their role in their children's mathematics education. However, this topic could be a worth researching in the future. At this time, it is not clear why the findings show a slight negative relationship between parents' expectations for their children's mathematics performance and their self-efficacy for helping their children succeed in mathematics. This may also be addressed in future research.

Predictive statistics were also computed to understand whether parental beliefs, expectations, and self-efficacy about helping children in mathematics predict their involvement in mathematics homework. The findings show that of the three variables, only parents' self-efficacy about their ability to help their children succeed in mathematics is a significant positive predictor of their involvement in mathematics homework. A correlation analysis shows that parents' self-efficacy for helping children succeed in mathematics has a strong positive

relationship with involvement in mathematics, and a regression analysis shows that it is a significant predictor of mathematics homework involvement by parents. Findings in this study indicate that these parents did not have a strong sense of efficacy for helping their children succeed, and that self-efficacy predicts involvement. One implication is that parental involvement in mathematics homework will be somewhat limited to the extent of their self-efficacy beliefs.

Parents' beliefs and attitude about the importance of mathematics did not reflect low expectations for their children's success in mathematics. In fact, parents' expectations for their children's performance in mathematics had a high mean of 4.38 (Table 26*, p.97*). Possible reasons for this finding could be that parents understand that their children's success in mathematics and reading, particularly as reflected in CRCT scores, determines academic programs and courses that will be available for them in the future. They understand the significance of having the required mathematics skills upon which promotion to higher grades are based, and upon which other academic opportunities are made available. Because they want their children to be successful, their expectations for their performance in mathematics are high. However, parents' expectations for children's mathematics performance do not predict their involvement in mathematics homework, as parents' self-efficacy does. A conclusion drawn from that finding is that parents believe that children's performance in mathematics is important, although they felt that they were not completely confident that they are able make a difference by their involvement in mathematics homework. In the final analysis, parents do not believe that mathematics is important, but they expect their children to do well in mathematics.

Conclusion

Parental involvement in mathematics homework and homework in general are similar in frequency. However, there are differences in levels of involvement among the various aspects of parental involvement. Specific aspects of involvement that are common or similar between the two vary in percentage—sometimes significantly so. For example, the most frequent aspect of parental involvement in homework in general is enforcing family rules for homework (90.2%). A difference in level of involvement between parental involvement in mathematics and parental involvement in general is that parents are more frequently involved in tutoring or assisting with homework in general (39.1%), than tutoring or tutoring in mathematics specifically (28.8%). Findings of this study that self-efficacy is a predictor of involvement in mathematics homework, and that parents in this study did not have a high sense of efficacy, could explain why their involvement in mathematics homework was significantly lower than in homework in general. The study also indicated that in terms of mathematics homework, the most popular involvement strategy by parents is that they take steps to ensure that children understand their mathematics homework (60.3%). However, this study did not elicit from parents the types of activities or steps that they undertake to ensure that their children understand mathematics homework. Therefore, parents' selection of activities to ensure that their children understand mathematics homework, and how these activities relate to mathematics achievement, could be an interesting concept for future research. Overall, parents are more involved with homework in general than in mathematics homework.

It is interesting to note that for this population of seventh grades students, parental involvement in general does not show a significant relationship with GPA, mathematics report card grades or CRCT mathematics scores, nor does parental involvement in general predict those

measures of achievement. However, there was a significant negative relationship between parental involvement in mathematics and mathematics achievement (math grades and CRCT math scores) as well as GPA. Parental involvement in mathematics is also a significant negative predictor of GPA, CRCT scores and mathematics grades. In essence, as mathematics achievement increases, parental involvement decreased across all measures of achievement in the study (CRCT math scores, math report card grades, and GPA).

There are other indirect parental involvement factors that are associated with mathematics achievement specifically. Examination of parents' attitudes and beliefs about the importance of mathematics, parents' expectations for their children's mathematics performance and their self-efficacy for helping children reach those expectations had interesting results. Although the average parent report*s* that that mathematics is not that important or necessary for life, they have high expectations for their children to do well in mathematics. Additionally, the average parent reported not feeling fully capable of helping his or her child reach those expectations. Very interestingly, of the three indirect involvement factors, parents' self-efficacy for helping his or her child succeed in mathematics turned out to be the single significant predictor for their involvement in mathematics homework. Since parents in this group had high expectations for their children's success in mathematics, it seems logical to think that parents' expectations would be a significant positive predictor of their involvement in mathematics homework. Taking this into consideration, conclusions could be drawn that despite parents' academic expectations for their children, level of parents' self-efficacy could hinder or encourage their involvement in mathematics homework. Another possible explanation for parents' high expectations for performance in mathematics could be that their expectations are a

reflection of their awareness of the educational systems' demands for performance in mathematics.

Limitations of the Study and Future Research

Parenting scaffolding or tutoring styles may make a difference in the effectiveness of homework, particularly mathematics homework, and may be addressed in future research. Another suggestion for future research is to examine the quality of the homework given, in order to understand whether that interaction with parental involvement influences achievement. The answer to these questions may be accomplished in a longitudinal study that takes into account parents' involvement in their children's education from a very early stage of their development (infant) through to the 12th grade of high school. Also, investigation into parents' perception of their role in children's mathematics education, particularly in the tutoring/teaching of mathematics, could further explain the findings in this study. Training of parents on effective involvement in mathematics through seminars or workshops aimed at increasing the quality of homework support given by parents, may help to alleviate some of the barriers to parental involvement in mathematics as well as parental involvement in general.

In addition, explanations for the finding that there is a small negative relationship between parents' expectations for children's mathematics performance and their self-efficacy for helping their children succeed were not provided in this study. Also, the unexpected finding that parents' more often chose to take steps to ensure that children understand mathematics, rather than other mathematics involvement strategies, appears to be an interesting concept for further exploration. Questions about what these steps are and how effective they are in terms of mathematics achievement could be answered.

Finally, this study used self-reported rather than actual or documented behaviors. Triangulating the data by adding the perspectives of students and teachers could provide a more accurate assessment of the various types and levels of parental involvement activities.

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Appendix A

Parent Questionnaire

PARENTAL INVOLVEMENT IN MIDDLE GRADES STUDENTS' MATHEMATICS ACHIEVEMENT

Dear parent or guardian:

We ask that the parent most involved in your 7th grade student's education complete this questionnaire. Filling out this questionnaire in its entirety will help us to understand how parental involvement influences middle grades students' mathematics achievement, and academic achievement in general. Please fill out the following survey and return it to your 7th grader's mathematics teacher. Your feedback is completely confidential. We appreciate your participation and prompt response!

GENERAL PARENTAL INVOLVEMENT (Parents, Guardians, Other Adults)		To the best of your ability, please choose the number that represents the most accurate response				
PARENT-CHILD DISCUSSION		**Never**	**Rarely**	**Sometimes**	**Often**	**Very Often**
1	I/We talk with my 7th grader about his/her day at school.	①	②	③	④	⑤
2	I/We talk with my 7th grader about his/her day at school.	①	②	③	④	⑤
3	I /We talk with my 7th grader about report card grades.	①	②	③	④	⑤
HOMEWORK IN GENERAL		**Never**	**Rarely**	**Sometimes**	**Often**	**Very Often**
4	How often do you help/tutor/work with your 7th grader on homework in general?	①	②	③	④	⑤
5	How often do you review/check/correct your 7th grader's homework in general?	①	②	③	④	⑤
6	Family rules about doing homework are enforced in our home.	①	②	③	④	⑤
7	Since August 2007, how often have any of your 7th grader's teachers contacted you for behavioral or academic reasons?	①	②	③	④	⑤
8	Since August 2007, how often have you contacted any of your 7th grader's teachers for behavioral or academic reasons?	①	②	③	④	⑤
9	Since August 2007, how often have you met with any of your 7th grader's teachers?	①	②	③	④	⑤

	EDUCATIONAL EXPECTATIONS	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
10	A failing grade for my 7th grader in any subject is unacceptable.	①	②	③	④	⑤
11	I/We expect my 7th grader to attend college.	①	②	③	④	⑤

	HOME STRUCTURING/PARENTING	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
12	Educational equipment/material/resources are available to my 7th grader at home.	①	②	③	④	⑤
13	There is a special place provided at home for my 7th grader to do his/her schoolwork.	①	②	③	④	⑤
14	I/We ensure that my 7th grader follows a schedule for doing homework, chores, and watching TV.	①	②	③	④	⑤

	PARENTAL INVOLVEMENT IN MATHEMATICS (Parents, Guardians, Other Adult)	**To the best of your ability, please choose the number that represents the most accurate response**				
	***MATHEMATICS* HOMEWORK**	**Never**	**Rarely**	**Sometimes**	**Often**	**Very Often**
15	I/We assist, tutor, work with my 7th grader on mathematics homework.	①	②	③	④	⑤
16	I/We make sure that my 7th grader understands his mathematics homework.	①	②	③	④	⑤
17	I/We work with my 7th grader on additional practice to help enhance my 7th grader's math skills.	①	②	③	④	⑤
18	I/We inspect my 7th grader's mathematics homework for thoroughness and completion.	①	②	③	④	⑤
		Yes	**No**			
19	My 7th grader does very well in mathematics and does not need my/our help.	①	②			
	COMMUNICATION WITH THE *MATHEMATICS* TEACHER	**Never**	**Rarely**	**Sometimes**	**Often**	**Very Often**
20	Since August 2007, how often has your 7th grader's mathematics teacher contacted you?	①	②	③	④	⑤
21	Since August 2007, how often have you contacted your 7th grader's mathematics teacher?	①	②	③	④	⑤

22	Since August 2007, how often have you met with your 7th grader's mathematics teacher?	①	②	③	④	⑤

EDUCATIONAL EXPECTATIONS FOR *MATHEMATICS*		**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
23	I/We expect my 7th grader to take advanced mathematics in high school or beyond	①	②	③	④	⑤
24	I/We expect my 7th grader to do well in mathematics.	①	②	③	④	⑤
YOUR BELIEFS AND ATTITUDE ABOUT *MATHEMATICS*		**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
25	Mathematics is not important for the advancement of civilization and society	①	②	③	④	⑤
26	We do not need mathematics to be successful in life	①	②	③	④	⑤
27	Mathematics helps to develop a person's problem solving skills.	①	②	③	④	⑤
28	The ability to do mathematics is an inherited trait—you either have it or you don't.	①	②	③	④	⑤
29	Everyone can do mathematics if they try hard enough.	①	②	③	④	⑤
30	Mathematics is really unnecessary.	①	②	③	④	⑤
YOUR FEELINGS ABOUT YOUR ABILITY TO HELP YOUR CHILD ACHIEVE IN *MATHEMATICS*						
31	I feel confident about my ability to help my 7th grader succeed in mathematics.	①	②	③	④	⑤
32	I am capable of teaching the middle grades mathematics curriculum to my 7th grader.	①	②	③	④	⑤
33	I am pretty good at mathematics.	①	②	③	④	⑤

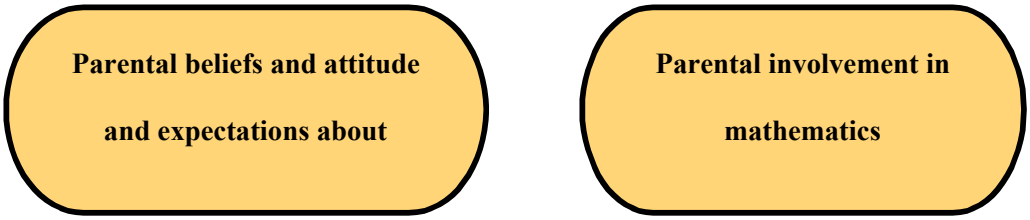
GENERAL INFORMATION		**Please complete the following section. This section asks questions about you that will help view your responses to this questionnaire in their proper perspective.**					
34	What is your relationship to the student?	**Mother** ①	**Father** ②	**Grand-mother** ③	**Grand-father** ④	**Legal Guardian** ⑤	**Other** ⑥
35	What is your gender?	**Male** ①	**Female** ②				

GENERAL INFORMATION (continued)		Please complete the following section. This section asks questions about you that will help view your responses to this questionnaire in their proper perspective.				
36	Are you the parent/guardian who is most involved, or at least equally involved in your 7th grader's education?	**Yes** ①	**No** ②			
37	How well do you speak English?	**Not al all** ①	**Not very well** ②	**Well** ③	**Pretty well** ④	**Very well** ⑤
38	Please indicate the employment status of the main income earner in the home for the last six months (self-employment included).	**Not working at this time** ①	**Working part-time** ②	**Working full-time** ③		
39	What is the highest level of education that you have completed?	**Below high school** ①	**Completed high school** ②	**1-2 years of college** ③	**4-year college degree** ④	**Post graduate degree** ⑤

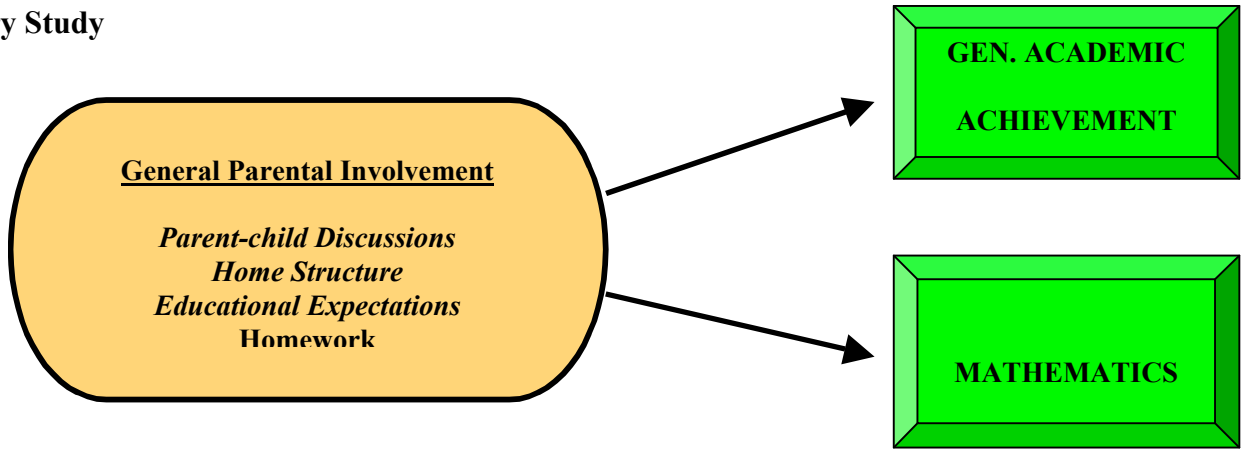
Appendix B

Conceptual Map

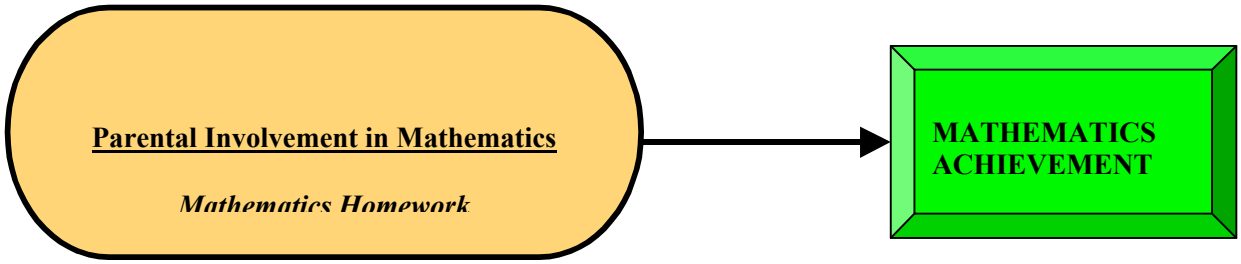
Descriptive Study



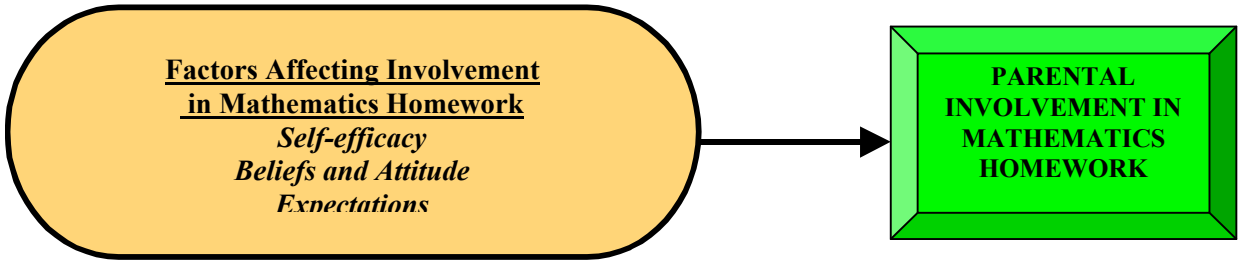
Replicatory Study



Extending Research



Exploratory Research



Appendix C

Grade Point Average

GPA	Frequency	Percent	Valid Percent	Cumulative Percent
1.714	1	.5	.5	.5
1.857	1	.5	.5	1.1
2.143	2	1.1	1.1	2.2
2.286	4	2.2	2.2	4.3
2.357	6	3.3	3.3	7.6
2.429	5	2.7	2.7	10.3
2.500	4	2.2	2.2	12.5
2.571	3	1.6	1.6	14.1
2.643	3	1.6	1.6	15.8
2.714	1	.5	.5	16.3
2.786	3	1.6	1.6	17.9
2.857	5	2.7	2.7	20.7
2.929	4	2.2	2.2	22.8
3.000	3	1.6	1.6	24.5
3.071	4	2.2	2.2	26.6
3.142	1	.5	.5	27.2
3.143	8	4.3	4.3	31.5
3.214	4	2.2	2.2	33.7
3.286	11	6.0	6.0	39.7
3.357	15	8.2	8.2	47.8

Appendix C (continued)

Grade Point Average

Scale Score	Frequency	Percent	Valid Percent	Cumulative Percent
3.429	16	8.7	8.7	56.5
3.500	9	4.9	4.9	61.4
3.571	10	5.4	5.4	66.8
3.643	2	1.1	1.1	67.9
3.714	4	2.2	2.2	70.1
3.786	2	1.1	1.1	71.2
3.857	10	5.4	5.4	76.6
3.875	1	.5	.5	77.2
4.000	42	22.8	22.8	100.0
Total	184	100.0	100.0	

Appendix D

Mathematics Report Card Grade

GPA	Frequency	Percent	Valid Percent	Cumulative Percent
51	1	.5	.5	.5
63	1	.5	.5	1.1
70	1	.5	.5	1.6
71	5	2.7	2.7	4.4
72	7	3.8	3.8	8.2
73	3	1.6	1.6	9.8
74	1	.5	.5	10.4
75	3	1.6	1.6	12.0
76	4	2.2	2.2	14.2
77	4	2.2	2.2	16.4
78	3	1.6	1.6	18.0
79	4	2.2	2.2	20.2
80	7	3.8	3.8	24.0
81	5	2.7	2.7	26.8
82	6	3.3	3.3	30.1
83	9	4.9	4.9	35.0
84	10	5.4	5.5	40.4
85	5	2.7	2.7	43.2
86	3	1.6	1.6	44.8
87	9	4.9	4.9	49.7

Appendix D (continued)

Mathematics Report Card Grades

GPA	Frequency	Percent	Valid Percent	Cumulative Percent
88	4	2.2	2.2	51.9
89	4	2.2	2.2	54.1
90	7	3.8	3.8	57.9
91	6	3.3	3.3	61.2
92	10	5.4	5.5	66.7
93	4	2.2	2.2	68.9
94	12	6.5	6.6	75.4
95	7	3.8	3.8	79.2
96	9	4.9	4.9	84.2
97	10	5.4	5.5	89.6
98	8	4.3	4.4	94.0
99	7	3.8	3.8	97.8
100	4	2.2	2.2	100.0
Total	183	99.5	100.0	
Missing	1	.5		
Total	184	100.0		

Appendix E

CRCT Mathematics Score

CRCT Score	Frequency	Percent	Valid Percent	Cumulative Percent
770	1	.5	.6	.6
772	3	1.6	1.7	2.3
775	1	.5	.6	2.9
777	2	1.1	1.2	4.0
779	2	1.1	1.2	5.2
784	3	1.6	1.7	6.9
786	3	1.6	1.7	8.7
788	1	.5	.6	9.2
790	7	3.8	4.0	13.3
792	4	2.2	2.3	15.6
794	4	2.2	2.3	17.9
796	2	1.1	1.2	19.1
798	2	1.1	1.2	20.2
800	7	3.8	4.0	24.3
802	4	2.2	2.3	26.6
804	3	1.6	1.7	28.3
806	4	2.2	2.3	30.6
808	2	1.1	1.2	31.8

810	3	1.6	1.7	33.5

Appendix E (continued)

CRCT Mathematics Score

CRCT score	Frequency	Percent	Valid Percent	Cumulative Percent
813	2	1.1	1.2	34.7
815	6	3.3	3.5	38.2
817	5	2.7	2.9	41.0
819	2	1.1	1.2	42.2
821	3	1.6	1.7	43.9
824	1	.5	.6	44.5
826	3	1.6	1.7	462
828	5	2.7	2.9	49.1
831	2	1.1	1.2	50.3
832	1	.5	.6	50.9
833	2	1.1	1.2	52.0
838	1	.5	.6	52.6
839	1	.5	.6	53.2
842	9	4.9	5.2	58.4
845	2	1.1	1.2	59.5
850	3	1.6	1.7	61.3
852	11	6.0	6.4	67.6

856	4	2.2	2.3	69.9

Appendix E (continued)

CRCT Mathematics Scores

CRCT score	Frequency	Percent	Valid Percent	Cumulative Percent
860	6	3.3	3.5	73.4
865	3	1.6	1.7	75.1
871	5	2.7	2.9	78.0
877	3	1.6	1.7	79.8
886	9	4.9	5.2	85.0
890	1	.5	.6	85.5
898	13	7.1	7.5	93.1
917	5	2.7	2.9	96.0
936	1	.5	.6	96.5
950	5	2.7	2.9	99.4
965	1	.5	.6	100.0
Total	173	94.0	100.0	
Missing	11	6.0		
Total	184	100.0		

Appendix F

Parental Involvement in Homework in General

Scale Score	Frequency	Percent	Valid Percent	Cumulative Percent
1.33	2	1.1	1.1	1.1
1.67	2	1.1	1.1	2.2
2.00	2	1.1	1.1	3.3
2.33	11	6.0	6.0	9.3
2.67	10	5.4	5.5	14.8
3.00	18	9.8	9.8	24.6
3.33	40	21.7	21.9	46.4
3.67	25	13.6	13.7	60.1
4.00	21	11.4	11.5	71.6
4.33	33	17.9	18.0	89.6
4.67	9	4.9	4.9	94.5
5.00	10	5.4	5.5	100.0
Total	183	99.5	100.0	
Missing	1	.5		
Total	184	100		

Appendix G

Parental Involvement in Mathematics Homework

Scale Score	Frequency	Percent	Valid Percent	Cumulative Percent
1.00	11	6.0	6.0	6.0
1.50	6	3.3	3.3	9.3
1.75	4	2.2	2.2	11.5
2.00	13	7.1	7.1	18.6
2.25	5	2.7	2.7	21.3
2.50	18	9.8	9.8	31.1
2.75	16	8.7	8.7	39.9
3.00	27	14.7	14.8	54.6
3.25	13	7.1	7.1	61.7
3.50	15	8.2	8.2	69.9
3.75	8	4.3	4.4	74.3
4.00	19	10.3	10.4	84.7
4.25	7	3.8	3.8	88.5
4.50	6	3.3	3.3	91.8
4.75	6	3.3	3.3	95.1
5.00	9	4.9	4.9	100.0
Total	183	99.5	100.0	

Missing	1	.5
Total	184	

Appendix H

Parental Involvement in General

Scale Score	Frequency	Percent	Valid Percent	Cumulative Percent
2.571	1	.5	.6	.6
2.643	1	.5	.6	1.1
2.786	1	.5	.6	1.7
2.857	3	1.6	1.7	3.3
3.000	3	1.6	1.7	5.0
3.071	2	1.1	1.1	6.1
3.143	4	2.2	2.2	8.3
3.214	4	2.2	2.2	10.6
3.286	5	2.7	2.8	13.3
3.357	11	6.0	6.1	19.4
3.429	8	4.3	4.4	23.9
3.500	4	2.2	2.2	26.1
3.571	12	6.5	6.7	32.8
3.643	15	8.2	8.3	41.1
3.714	9	4.9	5.0	46.1
3.786	4	2.2	2.2	48.3
3.857	15	8.2	8.3	56.7
3.929	18	9.8	10.0	66.7
4.000	9	4.9	5.0	71.7
4.071	8	4.3	4.4	76.1
4.143	13	7.1	7.2	83.3
4.214	7	3.8	3.9	87.2

4.286	2	1.1	1.1	88.3
4.357	8	4.3	4.4	92.8

Appendix H (continued)

Parental Involvement in General

Scale Score	Frequency	Percent	Valid Percent	Cumulative Percent
4.429	4	2.2	2.2	95.0
4.500	3	1.6	1.7	96.7
4.571	1	.5	.6	97.2
4.643	2	1.1	1.1	98.3
4.714	1	.5	.6	98.9
4.786	1	.5	.6	99.4
4.857	1	.5	.6	100.0
Total	180	97.8	100.0	
Missing	4	2.2		
Total	184	100.0		

Appendix I

Parental Involvement in General Grouped

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Low	59	32.1	32.1	32.1
Middle	61	33.2	33.2	65.2
High	64	34.8	34.8	100.0
Total	184	100.0	100.0	

Appendix J

Grade Point Average Grouped

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Low	62	33.7	33.7	33.7
Middle	61	33.2	33.2	66.8
High	61	33.2	33.2	100.0
Total	184	100.0	100.0	