The effects of a family mathematics workshop on the mathematics achievement of middle grades African American students

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This study was an investigation of the effects of a Family Mathematics Workshop on African American students' mathematics achievement and parent-child interaction with mathematics homework. A one way analysis of variance and the SPSS for MS Windows release 6.1 were used to test the null hypothesis.

The study is based on Epstein's theory of overlapping spheres which proposes that when the school and family unite in a partnership for children, their overlapping spheres of influence foster a positive attitude about mathematics at home that helps children learn mathematics at school.

The researcher found no significant difference between the posttest scores of the controlled and experimental groups. Further, there was no significant difference found in parent/child interaction of the experimental group with mathematics homework before and after the workshop. However, positive responses indicated an increase in the number of times per week parents played mathematics games.
with their children; the degree of parents' understanding of the lessons and assignments presented in their children's present mathematics textbook; and the degree of confidence parents' have in their ability to help their children with mathematics homework.

The conclusions drawn from the findings are that parental involvement in the educational process indicates positive impacts on students' achievement. This five session four-hour Family Mathematics study may have been too short to assess the impact of the Family Mathematics approach on these variables. A long term study is needed to assess the impact of the program on students' achievement. This study was also limited by having a sample size of only 20 fifth grade students in both the experimental and control groups.
THE EFFECTS OF A FAMILY MATHEMATICS WORKSHOP ON THE MATHEMATICS ACHIEVEMENT OF MIDDLE GRADES AFRICAN AMERICAN STUDENTS

A THESIS
SUBMITTED TO THE FACULTY OF CLARK ATLANTA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF SPECIALIST IN EDUCATION

BY
ADA M. SADLER

DEPARTMENT OF CURRICULUM

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CHAPTER ONE

INTRODUCTION

The effects of a family mathematics workshop on African American middle grades students' mathematics achievement were investigated in this study. Factors that affect African Americans' mathematics achievement are important when answers are sought to the significant underrepresentation of minorities (Black, Hispanics, and Native Americans) in all scientific, engineering, and other professional fields. The extent of their underrepresentation is in direct proportion to the amount of mathematics employed in the field.¹ The lack of preparation in mathematics, thus, makes many professions inaccessible to minorities. This inaccessibility not only imposes an economic handicap on them, but it also limits the future ability of the United States to compete with technologically advanced countries in global markets by having such a large number of its population unable to participate in mathematics related professions.

Research suggested various reasons why the number of non-Asian minority students lacking preparation in mathematics is higher than the number of White and Asian students. First, differences in culture produce vastly different evidence of mathematical achievement. Second, for minorities, the expectations of parents, teachers, and students in mathematics are low. Third, many minority students show little or no interest in mathematics.²

Since 1970, the number of Ph.D. degrees in the mathematical sciences earned by U.S. citizens has declined by nearly 50 percent. The majority of new Ph.D. degrees awarded in U.S. universities now go to foreign citizens, and White males earn three of every four doctoral degrees in the mathematical sciences awarded to U.S. citizens.³ To open doors to many scientific and business careers for African American students and enhance their opportunity to enjoy a decent standard of living, provisions must be made to give them a proper foundation in mathematics.

To enhance African American students' learning in the area of mathematics, activities that will increase parental involvement with students' mathematical learning have been perceived as a valid intervention. Previous research indicates that workshop programs are effective means to improve parental involvement in education and, ultimately,  

³Ibid.
provide a positive influence on students' academic success in school.  

Research further suggested that students' academic success improves with greater parental involvement. Students' mathematical abilities also improve when students are able to discuss their thinking with a family member. A closer parent-child and home-school relationship may prove motivational in other ways, such as in increased homework completion rates and better student attitudes about school and homework. "Generally, even those students who have fallen behind in their mathematics achievement can close the gap between themselves and other students within a

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'Chrislyn Zellars Luce, The effects of the family math parental program on students' cognitive and effective behaviors and parents' attitudes toward education. (The University of Southern Mississippi, 1993). DAI, 55A, 235. (AAC9417835)


"J.L. Epstein, et al., Manual for Teachers: Teachers Involve Parents in Schoolwork (TIPS), Language Arts and Science/Health. Interactive Homework in the Middle Grades (Baltimore, MD: John Hopkins University, 1992)."
relatively brief time, if a high quality instructional program is offered to them."

Becker and Epstein found that teachers of mathematics, science and social studies may need even more assistance than other teachers in preservice and in-service education to understand how to involve parents in their children's learning activities in those subjects. Parents have the ability to help their children and thus become a valuable resource to the classroom teacher. Myers points out that parents can be trained for whatever task needs to be done. In fact, many successful parental involvement programs incorporate workshops for training parents. The Math Pairs - Parents as Partners, MAP (Monitoring Achievement in Pittsburgh), AT-HOME, and Tips (Teachers Involve Parents in Schoolwork) are examples of programs which focus much attention on training parents.

"Asa G. Hilliard, Making Mathematics Work for Minorities (Georgia State University, 1990), 5.


Research has documented the positive influence of parental involvement on children's learning in all areas, and recent reform recommendations for education have become more inclusive as they call for parents, families, and the community at large to become involved in efforts to improve schools. The national education goals for the year 2000 suggest that educators foster partnerships among schools and parents: "Every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children." A Family Mathematics Workshop approach offers guidance for parents when they become involved in their children's mathematics assignments and allows parents and children to learn from each other as they progress through the activities.

Background of the Problem

Minorities and Mathematics Achievement

The National Research Council reported the following on the status of minorities. Although demographic factors influence all aspects of education, they affect mathematics

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education in especially troublesome ways. Among the many subjects taught in school, mathematics is probably the most universal, depending least on a student’s background and culture. As a result, mathematics education has, with few exceptions, been generally exempt from public controversy based on religion or social views. Indeed, mathematics has benefited from widespread support of its value in general education. Yet at the same time, precisely because mathematics has few links to issues of belief, mathematical ideas are not transmitted in our culture in the same way as are theories of evolution or standards of ethics.16

Students enrolled in advanced high school mathematics courses come disproportionately from White, upper- and middle-class families. Differences in culture and parental expectation, magnified by differential opportunities to learn imposed by twelve years of multiple tracked classes, produce vastly different evidence of mathematical achievement. Inadequate preparation in mathematics imposes a special economic handicap on minorities.17


The inescapable fact is that two demographic forces --increasing numbers of Black and Hispanic youth in the classrooms, and decreasing numbers of Black and Hispanic graduates in mathematics-- will virtually eliminate classroom role models for those students who most need motivation, incentives, and high-quality teaching of mathematics. The underrepresentation of this generation of minorities leads to further underrepresentation in the next, yielding an unending cycle of mathematical poverty. ¹⁰

The Mathematical Sciences Education Board outlined a National Action Plan designed to make mathematics work for minorities.¹¹ This framework now forms the basis for what is hoped will be a decade-long series of actions undertaken by the newly formed Alliance to Involve Minorities in Mathematics working in conjunction with the MSEB. In this report, Frank Press, president of National Academy of Sciences, stated the following for making mathematics work for minorities:

"Mathematics is important not just in the education of scientists, engineers, and economists, but also in the education of every working citizen in the United States. The world is changing, with an increasing emphasis on


science and technology in every aspect of life: the service sector, the manufacturing sector, and so forth. Consequently, quantitative skills are prerequisites to enjoying a decent standard of living. This, of course, has special significance for women and minorities, groups that have traditionally been shut out of many technical jobs and careers because of weak mathematics preparation. Increasingly, these groups will be shut out of just about any job in the years ahead without an adequate foundation in mathematics. The nation as a whole has to be sensitive to this problem and raise its priority concern, because as demographics show, our workforce is changing. And increasingly, the nation will have to depend on the talents and abilities of the traditionally under represented groups. Therefore, this is really an economic necessity for our nation."²⁰

In her charge to the National Convocation, Beverly J. Anderson, Director of Minority Affairs, Mathematical Sciences Education Board, 1990, stated the following:

"It is the goal of this group to establish a framework which will allow the nation to move from sympathy and seek ways to build minority self esteem and confidence in the mathematics classroom and in the work place. We will move beyond apathy to help all families establish home environments to support their children’s learning mathematics. We will move beyond using mathematics merely as a tool to control the wealth in this country and move toward using education in mathematics to protect the wealth of this country. We will move beyond perpetuating negative culture and educational stereotypes about Blacks, Hispanics and American Indians to promote excellence for all students."²¹


Currently, Blacks make up 12 percent of the U.S. population, Hispanics 9 percent, and American Indians 0.6 percent. Yet their representation drops sharply among individuals with academic degrees in mathematics, science and engineering. Blacks represent 5 percent of the holders of these bachelor’s degrees, Hispanics 3 percent, and American Indians 0.3 percent; at the doctoral level the numbers are even worse --1 percent for Blacks, 2 percent for Hispanics, and 0.1 percent for American Indians.22

Jobs requiring mathematical skills are growing at nearly double the rate of overall employment. In the past, such jobs have been filled by White males; but by the year 2000, there will not be enough White males trained in mathematics to satisfy workforce demands. Women and minorities must fill these workforce gaps, or the United States will be unable to compete with technologically advanced countries in global markets.23

Research has suggested several reasons for the lack of preparation of non-Asian minorities in the area of mathematics. Some of the educational realities are:

- Students are turned off from mathematics in elementary school.


23Ibid.
- Teachers often lack adequate preparation, support and delivery mechanisms.
- The expectations from parents, teachers and minority students, themselves, are low in mathematics.
- Lack of self-esteem and lack of self-confidence erode student interest.
- Inadequate early preparation prevents students in high school and college from taking advanced mathematics courses.
- There are woefully few positive role models in mathematics, especially minority teachers.
- Many schools rely on tracking, a system that sorts students into achievers and under achievers creating differential curriculum, expectations, and instruction which erodes mathematical desire.²⁴

Some researchers believe there is a need for programs which provide instruction to parents to help them work with their children.²⁵ A report completed at Johns Hopkins University, in 1983, stressed that parents already do help their children; only 20 percent of parents reported that they never help their children with reading or mathematics


skills during the school year.\textsuperscript{26} Hence, workshops would be a method to show parents effective ways to teach their children. Workshops have the potential to provide students with the confidence that they can excel in the subject areas emphasized and to provide parents with the confidence that they can help their child learn.\textsuperscript{27}

Although the parents' educational backgrounds differ, more- and less-educated parents have similar goals concerning their children's education.\textsuperscript{28} Research has found parent involvement to be more important in predicting success in school than the parent's educational levels, occupations, or socioeconomic status. Thus, children of all grade levels benefit from parental participation in education regardless of the parents' educational background or financial status.\textsuperscript{29}

The main differences among parents are: (1) their knowledge of how to help their children at home; (2) their beliefs that the teachers want them to assist their children


\textsuperscript{28}Ibid.

at home; and (3) the degree of information and guidance from their children's teachers in how to help their children at home. These factors will determine the degree and effectiveness of schools' practices of parental involvement.30

J. Youngblood and M. Youngblood argued that parents play a critical role by helping their children cultivate study habits which raise academic performance and nurture the skills (discipline, perseverance) required for success in life and on the job.31 But, as the Youngbloods wrote, parents cannot simply command good study habits. Doing so requires personal commitment—taking time to help, being patient and abstaining from watching television while children work.32

Statement of the Problem

African American students as a group suffer from low mathematical achievement as shown by test scores, grades, and minimal enrollment in advanced mathematics courses. Mathematics success has been linked to parental involvement. Therefore, this problem was investigated:


32Ibid.
1. What are the effects of a Family Mathematics Workshop on middle grades African American students’ mathematics achievement?

2. Do parents indicate on an informal survey that the Family Mathematics Workshop increased parent/child interaction at home with mathematics homework?

**Purpose of the Study**

The purpose of this study was to explore mathematical achievement outcomes for African American middle grades students when parent involvement is an intervention. This study attempted to answer two questions:

1. What are the effects of a Family Mathematics Workshop on middle grades African American students’ mathematics achievement?

2. Do parents indicate on an informal survey that the Family Mathematics Workshop increased parent/child interaction at home with mathematics homework?

It was hypothesized that a Family Mathematics Workshop would be beneficial to African American parents in helping them learn to assist their children with homework and understanding school expectations by providing them with activities and strategies to work with their children at home.
Research Questions

The Iowa Test of Basic Skills and an informal parent survey were used to answer the following questions:

1. What are the effects of a Family Mathematics Workshop on middle grades African American students' mathematics achievement?

2. Do parents indicate on an informal survey that the Family Mathematics Workshop increased parent/child interaction at home with mathematics homework?

Null Hypotheses

Hypothesis #1: There is no significant difference in mathematics achievement as measured by the Iowa Test of Basic Skills (pretest 1996 and posttest 1997) of African American children whose parents participated in a Family Mathematics Workshop and those of African American children whose parents did not participate.

Hypothesis #2: There is no significant difference in the parent/child interaction with mathematics homework of the experimental group before and after the workshop.

Limitations of the Study

The following represent the delimitations and assumptions of the study:

1. Subjects were students enrolled in the fifth grade at Chapel Hill Elementary School in the DeKalb County School System located in Decatur, Georgia.
2. Parents of students in the experimental group volunteered to participate in the Family Mathematics Workshops.

3. It was assumed that when parents are given the opportunity and trained, they would play the mathematics games and engage their children in the mathematics support activities on a regular basis throughout the week.

4. Houghton Mifflin’s Math To Go parental involvement support materials were used as the exclusive training program for parents.

5. It was assumed that mathematics teachers of these students followed DeKalb County’s Mathematics Curriculum Guide which is based on the National Council of Teachers of Mathematics (NCTM) Standards.

6. A sample of twenty fifth grade students comprised the sample.

7. The intervention consisted of five four-hour workshops.

8. The informal survey was given at the end of the workshop for before and after responses regarding parents’ levels of interaction with children.
Definition of Terms

The following terms are defined as they were operationalized in this study.

A. Parental Involvement is a term which encompasses the many methods parents use to participate in their child's education. Education researcher Joyce Epstein documents six major types of parental involvement. "The six types of involvement occur in different places, require different materials and processes, and lead to different outcomes." 33

Type 1 - The basic obligations of parents refers to the responsibilities of families to ensure children's health and safety; to the parenting and child-rearing skills needed to prepare children for school; to the continual need to supervise, discipline, and guide children at each age level; and to the need to build positive home conditions that support school learning and behavior appropriate for each grade level.

Type 2 - The basic obligations of schools refers to the communications from school to home about school programs and children's progress. Schools vary the form and frequency of communications such as memo, notices, report cards, and conferences, and greatly affect whether the information

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about school programs and children’s progress can be understood by all parents.

Type 3 - Parent involvement at school refers to parent volunteers who assist teachers, administrators, and children in classroom or in other areas of the school. It also refers to parents who come to school to support student performances, sports, or other events, or to attend workshops or other programs for their own education or training.

Type 4 - Parent involvement in learning activities at home refers to parent-initiated activities or child-initiated requests for help, and ideas or instructions from teachers for parents to monitor or assist their own children at home on learning activities that are coordinated with the children’s classwork.

Type 5 - Parent involvement in governance and advocacy refers to parents taking decision making roles in the PTA/PTO advisory councils, or other committees or groups at the school, district, or state level. It also refers to parent and community activists in independent advocacy groups that monitor the schools and work for school improvement.

Type 6 - Parent involvement in community collaboration refers to coordinating the work and resources of community businesses, agencies, colleges or universities, and other groups to enhance student learning, family practices, and
school programs. This collaboration includes holding community meetings that not only inform the community about the mathematics programs in their schools, but also allow mathematics educators to hear the needs of the community.\(^3\)

B. Student Academic Achievement was defined by the scores achieved by students on the Iowa Test of Basic Skills using the complete composite score.

C. Family Mathematics Workshop was defined for the purposes of this study as a five-week program of mathematics training using Houghton Mifflin's *Math To Go* (1995) Family Involvement Materials which correlate directly with the student math textbook. These workshops were attended by students with their parents. The Family Mathematics Workshop was based on educational researcher Joyce Epstein's Type-4 meaning of parental involvement.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Theoretical Framework

This study of the effects of parent involvement on African American middle grades students' mathematics achievement through increasing parental involvement is based on Epstein's theory of overlapping spheres. There is vast and increasing literature which documents the importance of school and family connections for increasing student success in school and for strengthening school programs; however, there is a scarcity of research which identifies the variables which influence the level of parental involvement in the area of mathematics homework and how this involvement influences student mathematics achievement, attitudes toward mathematics and parental attitudes toward mathematics education.

Epstein's theory of overlapping spheres of influence of families and schools on students' learning and development, and on family and school effectiveness is supported by a
growing number of studies.¹ He lists several benefits from greater overlapping. For example, when teachers make parent involvement part of their regular teaching practice, parents increase their interactions with their children at home, feel more positive about their abilities to help their children in the elementary grades, and rate the teachers as better teachers overall; and students improve their attitudes and achievement.² Epstein’s model of overlapping spheres diagram shows that the external structure of the model consists of overlapping or non-overlapping spheres representing the family and social environments. The degree of overlap is controlled by three forces labeled time, experiences in families, and experience in schools. Force A represents a developmental time and history line for students, families, and schools. Time refers to individual and historic time - the age and grade level of the child and the social conditions of the period during which the child is in school. For example, in infancy the spheres in our model may be separate. The child first "attends" home, and the family provides the main educating environment. Parents and teachers do not initially interact directly about the


child's learning. Even in infancy, however, the spheres may overlap. For example, if an infant is physically, mentally, or emotionally handicapped, parents and special teachers may begin a highly organized cooperative program to benefit the child. For all children, the family and school spheres may overlap to some extent in infancy and early childhood, as parents apply knowledge of child rearing and school readiness from books, their own experiences, and information from pediatricians, educators, and others. Later, in a regular pattern spheres overlap when the child "attends" home and school (figure 1).

**Figure 1**
Diana T. Slaughter-Defoe stated that the family's influence upon children's achievements is largely independent of family structure. She noted that what appears to be considerably more important to a child and adolescent school achievement in African American communities is the quality of interaction among and between family members and the children themselves. Slaughter Defoe also reported that parental involvement is central to successful child achievement. With family commitment to the educational mission of the school in which their children are enrolled, African American children can be successful school achievers.

In a study by Stevenson and Baker in 1987, a comparison was made between the degree of parent involvement in schooling activities and the children's performance on

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achievement measures. Results indicated that students of parents who were more involved in the school were rated by their teachers as more academically successful than those students who had less involved parents ($r = .47$, $p < .01$). Stevenson and Baker reported that parents of younger children (compared to older students through adolescence) are reported by teachers to be more involved in meetings and conferences at their children’s school.\footnote{D.L. Stevenson & D.P. Baker, "The family-school relation and the child’s school performance," Child Development 58 (1987): 1348-1357.}

Epstein’s earlier studies and reviews suggested that six major types of involvement are part of schools’ comprehensive programs to share responsibilities with families for the education of their children.\footnote{Ibid.}

Type One: The basic obligation of parents refers to the responsibilities of families to ensure children’s health and safety; to the continual need to supervise, discipline, and guide children at each age level; and to the need to build positive home conditions that support school learning and behavior appropriate for each grade level.

Type Two: The basic obligation of schools refers to the communications from school to home about school programs and children’s progress. Schools vary the form and frequency of communications such as memos, notices, report cards, and

\footnote{J.L. Epstein, "Theory to Practice," 1994.}
conferences, and greatly affect whether the information about school programs and children’s progress can be understood by all parents.

**Type Three: Parent involvement at school** refers to parent volunteers who assist teachers, administrations, and children in classrooms or in other areas of the school. It also refers to parents who come to school to support student performances, sports, or other events, or to attend workshops or other programs for their work education or training.

**Type Four: Parent involvement in learning activities at home** refers to parent-initiated activities or child-initiated requests for help, and ideas or instructions from teachers for parents to monitor or assist their own children at home on learning activities that are coordinated with the children’s class work.

**Type Five: Parent involvement in governance and advocacy** refers to parents taking decision making roles in the PTA/PTO advisory councils, or other committees or groups at the school, district, or state level. It also refers to parent and community activists in independent advocacy groups that monitor the schools and work for school improvement.

**Type Six: Parent involvement in community collaboration** refers to coordinating the work and resources of community businesses, agencies, colleges or universities, and other
groups to enhance student learning, family practices, and school programs. This collaboration includes holding community meetings that not only inform the community about the mathematics programs in their schools, but also allow mathematics educators to hear the needs of the community.\(^9\)

Epstein noted that Type Four - parent participation in learning activities at home, is the type of involvement with which most parents want more help. Epstein's research showed subject-specific connections between teachers' practices and parent involvement in mathematics and science, subjects that are more difficult to organize for parent involvement at home.\(^10\)

Epstein concluded that schools with programs including the six types of involvement help parents build home conditions for learning, understand communications from schools, become productive volunteers at school, share responsibilities in their children's education in learning activities related to the curriculum at home, and include parents' voices in decisions that affect the school and their children.

The development of the Family Mathematics Workshop was supported by and is consistent with research that suggested that when teachers help them, parents of all backgrounds can


be involved productively in their child's educational experience. The workshop was designed to increase and enhance parental involvement in mathematics learning activities at home. The program provides guidance from teachers for parents to assist their own children at home on learning activities that are coordinated with their children's mathematics class work. The parents are trained through five, four-hour workshops using Houghton Mifflin's *Math To Go* family involvement support materials.

H.J. Becker and J.L. Epstein found no disagreement regarding the belief that successful parent involvement programs require both teachers' and parents' commitment. There are usually no formal rewards for teachers or parents for the time and effort required to plan and conduct learning activities at home. However, both may have feelings of satisfaction when children make progress in learning.

The Family Mathematics Workshops were presented using the Constructivist Approach to learning. As Paul Cobb and Leslie Steffe explained "from the constructivist perspective, mathematical learning is not a process of internalizing carefully packaged knowledge, but is instead a matter of reorganizing activity, where activity is

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interpreted broadly to include conceptual activity or thought. The constructivist theory suggested that students construct knowledge for themselves by restructuring their internal cognitive structures.

Cobb and Steffe further analyzed the constructivist view of teaching by noting that "in the constructivist view, teachers should continually make a conscious attempt to 'see' both their own and the children's actions from the children's point of view." A constructivist teacher would initiate activities, and the child would reflect on and abstract patterns or regularities from these. Cobb suggested that those who view teaching as the facilitation of the construction of knowledge would follow a "teaching by negotiation" model. Cobb and Steffe explained that the teacher's role in initiating and guiding mathematical negotiations is a highly complex activity that includes highlighting conflicts between alternative interpretations or solutions, helping students develop productive small group collaborative relationships, facilitating mathematical dialogue between students, implicitly legitimizing selected aspects of contributions to discussions in light of their

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14Ibid.

15Paul Cobb, "The Tension Between Theories of Learning and Instruction in Mathematics Education," Educational Psychology Review Vol. 23 (Spring 1988): 87-110.
potential fruitfulness for further mathematical constructions, redescribing students' explanations in more sophisticated terms that are nonetheless comprehensible to students, and guiding the development of taken-to-be-shared interpretations when particular representational systems are established.16

History of Parental Involvement

Parents have been charged with teaching their offspring how to survive since the first man and woman became parents. First they learned to teach their children about the dangers in the universe, for example, weather and animals. As civilization developed, parents had more and more things to teach their children about surviving. When the vastness of learning became too much for parents only, a formal schooling process evolved. Around the 18th century, parents were expected to provide formal education for at least their sons.17 In America, school attendance laws were enacted in Massachusetts in 1852,18 and education was thought the best method to teach citizenship and preserve the democratic way of life.


In the 20th century, the federal and state government have been very active in making laws which affect the way children are educated and the involvement of parents. Programs such as Head Start and Title I involved parents in the schooling process. Much data have been generated from studying these programs and have added to the information regarding the positive effects that parents who are involved in the education process have on the progress of their children.

Parental involvement programs have become popular in schools within the past several decades. The roles parents have played in this process have also changed. In the 1950s, parents primarily voted on bond issues and were responsible for their child's attendance. In 1965, the Elementary and Secondary Education Act was passed by Congress and called for parents to participate actively in their children's education. A number of programs designed by the government were enacted to encourage parents to be more involved in the school system.

Following the creation of programs requiring parental involvement in education by federal, state and local

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governments during the 1970s, researchers began to evaluate these programs. They determined that it was a necessity for parents to participate in their child's education. One researcher described the need for parent participation as "critical in facilitating children's development and achievement and in preventing or remedying educational and developmental problems."²¹

Parental Involvement Research Overview

Many studies have consistently shown the relationship between improved academic achievement and parental involvement. For example, results of a study by Stevenson and Baker, in 1987, showed that students whose parents were more involved in their children's school were considered by teachers to be more academically successful than those students whose parents were less involved.²²

In 1980, Herman and Yeh discovered similar results when they studied the relationship between parental involvement and school outcomes.²³ The researchers randomly chose two second grade and two third grade classes from the 256 schools in the study. The results showed the positive


effect of parental involvement on students' performance on standardized achievement tests.

Moreover, higher academic achievement is just one result of parental involvement. Various studies have shown that parental involvement also has a strong impact on student's self-esteem, attitude toward school, motivation to learn, and reading and mathematics skills.24 Studies by Haynes, Comer and Hamilton-Lee found that parents and students involved in parent programs rated the school climate higher than parents and students who did not participate in these programs.25

Most studies have focused on parental involvement and reading skills. Navin and Bates,26 and Siders and Sledjeski27 found a correlation between students' attitudes towards reading and parental participation in education.


Herman and Yeh recommended that schools invite parents to participate in the school and outside of school more often because parents are valuable and free resources for schools struggling to juggle thinning dollars. In addition to the benefits schools receive from parental involvement, their studies indicated that families also benefit when parents are directly involved in school activities. Becher found that parents who participated in school programs developed positive attitudes about themselves and felt more self confident. An Epstein study reported that parents were more aware of the school curriculum when teachers requested home instruction. Furthermore, parents showed an increased respect and closer relationship with their children after participating actively in school programs.

Research has found that teachers are ambivalent about actively seeking more parental participation in their classrooms. Some teachers feel that they give too much power to the parents; others find it is a necessary component for improving a child’s education and the school system itself. In a study conducted by John Hopkins University in 1983, eighty two teachers were interviewed regarding their beliefs about usage of parental

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involvement. Most of the teachers believed parental involvement could solve problems in the classroom and improve learning, but they did not feel they had enough training on how to plan and implement these programs. The teachers were divided regarding their perceptions of their own influence on parents. Some believed they could influence parents to be more active in their children’s education, while others believed the time consumed in planning and administering parental involvement programs was not beneficial.

In addition, teachers reported that if parents were more involved in schools, they would become more critical of the schools and no longer refer to teachers as experts. They also believed parents would demand their child receive more attention, break commitment to program, and teach subjects incorrectly to the children.

Finally, some researchers found that good results followed when parents are taught how to help their children with schoolwork. Research conducted in 1989 by Dauber and

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33 R. Becher, Parents and schools, 1986.
Epstein, noted that attitudes and behaviors of parents were affected immediately by parental involvement programs. They found that parents were more active in their child's education when the child was in a school with a strong parental involvement program.

**Mathematics Achievement and Parental Involvement**

Most research on parental involvement is based on reading and language arts programs. A few have used mathematics in programs to demonstrate how parental involvement improves children's education. In one of these studies, Cain-Caston concluded: "In education, an important influence on achievement in a subject is attitude towards that subject. Therefore, an important goal of the parent and the educator is to promote positive attitudes toward mathematics in order that students will develop positive attitudes toward mathematics."^{34}

In 1980, two researchers, Wilhelm and Brooks, found that students' attitudes toward mathematics stemmed from their parents' experiences with and attitudes toward mathematics. The researchers surveyed parents of 241 junior high school students and documented parents' anxiety, self

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confident in mathematics. After students were surveyed in the same areas, Wilhelm and Brooks found that children are most influenced by their parents of the same gender where mathematics anxiety is concerned. Gender differences and mathematics ability perceptions in the study were not consistent. Mothers with children of low mathematics ability tended to have a negative influence on their daughters; however, fathers with children of low mathematics ability valued mathematics less than their sons.

In 1983, another researcher, Jayaratne, conducted a study to determine if parents' past experiences in mathematics affected their perceptions of their children's performance. His findings were similar to those of Wilhelm and Brooks: Students' attitudes toward mathematics stemmed from their parents' attitudes and experiences toward mathematics. In other studies, Jayaratne found an important relationship between parents' perceptions of

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children’s ability and parental biases toward mathematics. 3 Jayaratne sent out two surveys to hundreds of parents. The first survey asked parents to describe their experiences and feelings about mathematics. On the second survey, parents were asked to describe their children’s mathematics abilities and their children’s attitudes regarding mathematics. The study revealed that fathers often felt their experiences with mathematics were positive, while most mothers did not, even when they recalled doing better than the father in mathematics. Fathers most often viewed men as better in mathematics, while mothers’ impressions of their daughters’ mathematics ability was affected by the mothers’ past experience in mathematics. Moreover, if a parent had strong feelings whether positive or negative regarding mathematics, their perceptions of their children’s mathematics performance were biased. Thus, Jayaratne showed that parents’ attitudes and beliefs have an enormous impact on their children’s achievement in mathematics.

More recently, in 1991, researchers Tocci and Engelhard used four thousand children in an experiment to find out if gender influenced attitude toward mathematics and also if parental support influenced mathematics achievement. They

found a definite relationship between gender and attitudes toward mathematics as well as between parental support and mathematics achievement.38

Factors That Affect Parental Involvement

Research indicated that parents and teachers influence students' cognitive and affective behaviors. Adults significantly alter children's self esteem, motivation to learn, anxiety, achievement, and future career choices.39 Much research has focused on the effects of parental involvement programs on the achievement of children from lower socioeconomic groups. The RMC Research Corporation investigated the attitudes and perceptions of parents of children in Chapter I programs. As a result of their study, they wrote what came to be called the "Ten Truths of Parent Involvement."40 Although they are based upon research on parental involvement programs for lower income families, the statements are universal in nature:


1. All parents have hopes and goals for their children. However, parents differ in their ability to assist their children in reaching these goals.

2. The children are influenced by the home, school and peers. Therefore, the school should aim to pull the home and school into closer contact.

3. Parents are the main contributors to children’s education. They know their children well, stay with the children throughout the school years, and influence the children’s attitudes and values about education.

4. Parents’ participation results in improved attitudes and gains in achievement and must become a priority of the schools.

5. Parent involvement takes organization, time and direction.

6. The purpose of parent involvement is to stimulate positive parental interactions with their children.

7. To implement a successful parent involvement program, goals, policies and activities must be planned.

8. Steps must be taken to remove barriers which currently prevent parents from taking an active role in their children’s education.

9. Goals must be established and plans made so that parents from every background become involved.

10. New relationships and partnerships between parents and teachers must be formed.
It is likely that parents from every income level are less involved in their children’s education than they should be. Uninvolved parents may feel that they lack the knowledge or time to help their children adequately. A study was conducted involving 1,269 parents of students in the first, third, and fifth grades. The researcher found that most parents were strongly in favor of involvement and felt that the school could do more to involve them in home learning activities. The majority of parents also indicated that they rarely received any type of contact from their children’s teachers. Epstein found that most parents do not help in the schools. Over 70 percent of these parents said that they have never helped in the classroom or gone on class trips. Additionally, 70 percent of the parents revealed that they have never participated in helping raise funds for the school, and 88 percent reported that they had never assisted in the library, cafeteria, or


office. Additionally, parents reported that they became less involved as their children grew older. However, parents did express a willingness to help their children; when questioned about how much help they give their children at home with school work, 85 percent said that they spend at least 15 minutes helping with homework when asked by teachers to do so. These parents also acknowledged that they were open to spending more time and could be of greater assistance to their children if the teachers would show them what to do. Epstein concluded that because parents already reported that they do help their children at home, teachers could arrange workshops to show parents how to work with their children and reap the maximum benefits from the time children and parents spend working together."

A recurring theme found in studies is the challenge for schools to develop approaches that encourage more parental involvement rather than less. Studies conducted at the John Hopkins University Center for Research on Elementary and Middle Schools concluded that parents are more involved with their children at school and home when they believe the school encourages them to be involved. According to the studies:

"The school’s practices to inform and involve parents are more important than parent education, marital status and even grade levels in determining whether inner city parents get involved with their children’s education in

elementary school and stay involved through middle school."

Empowering parents by encouraging their participation and offering them opportunities to learn to help their children with schoolwork is a way to improve parental involvement of parents and thus improve the academic performance of their children.

The literature on parental involvement in middle schools began to receive closer scrutiny during the mid 1980s. The body of work basically concluded that parents tire of the schooling process by the time their child reaches age six. "The novelty of school is often replaced by fatigue with school and exhaustion from work."" Increasing Parental Involvement Through Training

Parents have the ability to help their children and thus become a valuable resource to the classroom teacher. Myers pointed out that parents can be trained for whatever task needs to be done." Epstein listed in detail nine strategies to involve parents in the school." They include:

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- Training opportunities
- Homework helplines
- Directory of all personnel
- Promotion and recognition of parent efforts
- Casual social affairs
- Survey of needs and interests
- Bulletins and newsletters
- Telephone trees
- School "welcome wagons"

Becker and Epstein offered the following as strategies teachers use to involve parents: reading activities, learning through verbal communication, home activities, contracts between parents and teachers, and techniques to improve parents' instructional skills.49

In 1992, Butler and Henderson interviewed teachers, parents and school administrators living in Mississippi about the most common methods used to involve parents in the educational process.50 Parent/teacher conferences were the most common strategy according to those surveyed. The three groups also rated inviting parents to work on advisory committees and getting the parents to attend open house. Parents listed helping children with homework as a form of parental involvement, but representatives of the school


system did not. Butler and Henderson concluded that parents believe homework is an important part of schooling more so than teachers and administrators.\textsuperscript{51}

According to Coleman, many teachers neglect to see homework as an important parental involvement strategy,\textsuperscript{52} and also expect parents to know how to teach their children. Henderson concluded that if school and home do not work together, children often drop out of school as a result.\textsuperscript{53} He believed homework is undervalued as a method to bring parents and teachers together. VanDevender suggested teachers have to encourage parents by informing them of events, showing them how to motivate students and communicating with them frequently.\textsuperscript{54}

For the past 25 years, one federally funded program has promoted the importance of parental involvement, The Follow Through Program. Designed for elementary school students, the program makes a strong effort to reach out to disadvantaged parents in school activities. The program also teaches parents how to improve their home teaching techniques and to create a positive learning environment at


A major outcome of the programs has been an increase in the number of low-income parents who have become advocates for parental involvement nationally, locally and individually. As a result, these parents have also shown more involvement in school activities. The end result of this advocacy has been overall improvement in all areas including student achievement, performance and self concept. A 1983 study of the same program by Rubin, found that these students were also less likely to drop out of school than were their counterparts whose parents did not participate in the program.

Based on the premise that students will improve their academic performance when parents, teachers and students collaborate, the DeKalb County School System in Georgia designed a plan to achieve this goal. Families signed contracts with schools agreeing that the student would work a specified amount of time after school. Parents also agreed to help teachers and students when necessary. The school system attributed a rise in achievement scores to these contracts and found this program to be an effective way to extend the school day slightly.  


According to Thurston, children believed school was important when their parents spent time with them on school work.57 In return, parents witnessed the value of homework when the students did learn because their parents stepped in to assist them. Other teachers found that using parent/student workshops helped encourage parents to participate in other school activities. These workshops provided parents with the knowledge, skills, and confidence necessary for successful interaction with teachers.58 Allen and Freitag held workshops to enhance students' study skills. Many parents said they felt better able to help their children as well as enjoyed the time they were able to spend with their children.

Giordano attributed the success of workshops to parents who enjoy the role of designing the workshops.59 The parents decided on a topic for discussion at an open house and provided input regarding the relevance of topics to students' education throughout the year. At the end of the school year, Giordano surveyed the parents and found that they had learned from and were enthusiastic about the program.


The Tennessee General Assembly developed and implemented eleven parental involvement programs and located them at seventeen sites. The programs were designed to increase the number of volunteers in the schools, teach parents techniques to help their children who have mental or physical disabilities, improve the relationships between the community and the schools, and finally to improve parents’ child-rearing techniques. Two of the programs focused on parents helping their children have successful academic experiences in school. One of the programs featured a series of parent-student-teacher conferences. The second program, Family Mathematics, used workshops in which children and parents regularly played mathematics games together at home. This program was well received by participants and has now become a widespread program. Originally, Family Mathematics was designed to help children of lower socioeconomic families, and girls in particular, across all socioeconomic boundaries. The United States Department of Education began a pilot program in low-income, inner-city schools in 1981. The program has now been

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60 D. Lueder, "Tennessee parents were invited to participate and they did," Educational Leadership 41 (1), (1989): 15-17.

61 Ibid.

used across all gender and socioeconomic backgrounds.\textsuperscript{63} Thompson and Kreinberg asserted that the materials produced by Lawrence Hall have been appropriate for children and adults of all ages, backgrounds and cultures.\textsuperscript{64} What makes the programs unique is that it is taught in an informal manner so that mathematics is not only logical but fun to learn as well.\textsuperscript{65} The Family Mathematics Program has several goals. Thompson and Cittadino listed the following as goals of the program:\textsuperscript{66}

- To teach parents how to help children with mathematics;
- To show parents ways to better communicate with their children;
- To inform parents about the future importance of mathematics in their children's lives;
- To develop parents' understanding of the mathematics taught in the schools;


- To develop positive attitudes about mathematics among all family members;
- To show that mathematics can be fun.
- To strengthen the role parents take in their children's education.

The goals were perceived to be achievable because of the following four workshop characteristics: a supportive environment where risk taking is encouraged; mathematics is taught through content and not worksheets; the teaching style is aimed to improve the interactions between parents and children; and participants discuss the future needs and uses of mathematics.

Unfortunately, not much quantitative research assessing the effects of the Family Mathematics Program has been published; rather, the reports have been primarily descriptive accounts of parents', students' and teachers' attitudes after participating in the program. Devaney interviewed nine teachers who used the Family Mathematics Workshop and found they had many characteristics in common including a high interest in mathematics, a belief that parental involvement is important, a willingness to work with other teachers and adults, and a desire to have new

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experiences and perspectives." Heller found that teachers who participated in a Family Mathematics training session claimed to feel less mathematics anxiety and increased confidence in teaching mathematics." Moreover, David and Shields discovered that teachers who hosted a Family Mathematics Workshop found new methods to teach mathematics, and the workshop also rekindled an interest and enthusiasm for teaching. Teachers also reported an increase in parent contact and a better ability to communicate with them.70

Teachers were not the only ones to report positive effects from the workshops. Parents also stated they had benefitted from the workshops.71 Weisbaum interviewed parents before, during, and after they completed the Family Mathematics Program and found that parents felt less mathematics anxiety, expressed confidence in helping their children understand mathematics assignments, and indicated a better understanding of their child's learning style,


academic strengths and weaknesses. Finally, children who participated in Family Mathematics said they felt more positive about mathematics. David and Shields also found the teachers believed the students became better problem-solvers than they were before participating in the Family Mathematics.  

Mathematics Academic Achievement of African American Students

The 1990 Annual American Mathematics Association report indicated that there were only 401 Ph.D.'s in mathematics awarded to U.S. citizens, and only 4 (1%) were African Americans. Walter G. Secada stated, "For over 40 years we have been confronted with an ever-growing body of research documenting that the American educational system is differentially effective for students depending on their social class, race, ethnicity, language background, gender, and other demographic characteristics. This differential effectiveness has been found in mathematics as well as in many other academic subjects. Disparities can be found between Whites and Asian Americans on the one hand and African Americans, Hispanics and American Indians on the other; between males and females; among groups based on

73Ibid.  
their English language proficiency; and among groups based on social class."

Many concerns regarding the disparities in the mathematics education of diverse groups have been voiced. Some commentators take disparities as evidence of deep structural injustices in how the American schooling system distributes opportunities to learn mathematics and, hence, in the actual acquisition of mathematical knowledge. Hence, research about the nature of these disparities is needed to help schools better educate a portion of the population that is growing and for whom schools have not been successful. Consensus is developing, too, that disparities in the learning of mathematics represents a danger to our society's functioning." Full participation

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"Walter G. Secada, "Race, Ethnicity, Social Class, Language and Achievement in Mathematics," Handbook of Research on Mathematics Teaching and Learning, 1992; 624-647.


in our most cherished democratic institutions, projections for civilian workforce and military needs, and shifts in our country's and the world's economic systems all point to the need for everyone -- not just for a few -- to possess more and different mathematical and scientific literacy than is currently made available in schools." There is a danger that mathematics education for members of these groups will remain unreformed and unrestructured. Under such conditions, disparities in opportunities, achievement, course taking, and careers are likely to increase, resulting in the creation of a permanently unemployable underclass who will represent a threat to the United States' economic and


military well-being and who will strain the country’s legal and social service systems." 

Much of the renewed concern for the mathematics education of diverse learners can be linked to the realization that the school age population of the United States is becoming increasingly diverse and that growth will occur in precisely those groups for whom the educational system has not worked as well as it should. In 1976, 24 percent of the total student enrollment in U.S. schools was non-White; by 1984, the figure had risen to 20 percent; by the year 2000, between 30 and 40 percent of the country’s school population will be minority.80

Hispanics are being increasingly segregated in school.81 African Americans, although they are attending nominally desegregated schools, are being grouped and

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treated in ways that still constrain their educational opportunities."²

Achievement in mathematics is often used as an indicator of "how much" mathematics someone knows or possesses. Typical tests of mathematics achievement have been criticized for being dominated by low-level, basic skills items that are easily produced in a paper and pencil format."³ Despite these and other shortcomings, achievement tests have been a primary source of evidence for investigating inequality in the education of diverse groups.

From the age of 9, African Americans and Hispanics do not perform as well as Whites on national surveys of mathematics achievements. For example, NAEP mathematics assessments were conducted in 1973, 1978, 1982 and 1986, respectively. Originally, the 1973 data were not reported in terms of demographic group membership."⁴ But subsequently, Anick, Carpenter and Smith compared the


performance of African Americans and Hispanics to National norms for the 1973 and 1978 NAEP change terms.85 (Changed items are those that were administrated in both the 1973 and 1978 assessments to investigate the change in student achievement across time of administration). Overall, 9, 13 and 17 year olds scored an average 38, 53 and 52 percent, respectively on the 1973 change items. For African Americans, the comparable statistics were 23, 32 and 34 percent; and for Hispanics they were 28, 40 and 38 percent.86 For the 1978 mathematics assessment, Anick et al. reported that, nationally, 9, 13 and 17 year olds scored 53, 54 and 58 percent total correct; African Americans scored 41, 49 and 41 percent, respectively; and Hispanics scored 42, 43 and 46 percent.87

The general picture of racial and/or ethnic disparities in mathematics achievement that comes from the NAEP data is that Whites perform much better in mathematics than do Hispanics, who, in turn, achieve slightly better than do


"C.M. Anick, et al., Results from the NAEP, 1981 (Table 2) 562.

"Ibid.
African Americans. These cross sectional data suggest that achievement disparities, which are great to begin with, increase over time, as students grow older."

National achievement data exhibit a roughly parallel pattern: In terms of average scores and the distribution of students at or below certain cutoffs. Whites do much better than Hispanics, who do slightly better than African Americans. The California data, however, are a departure from this pattern. Mean-score data from the California assessments indicate that White and Asian students do much better than Hispanics who do slightly better than African Americans, who in turn seem to perform slightly better than American Indians; this follows the national trends. Yet, data based on rates of students who score below a given cutoff reveal a consistent pattern in which African American students do better than Hispanics. This suggested that one of the two distributions is skewed and that there may be statewide, if not regional, variations in these disparities.

In comparing changes in average performance among Whites, African Americans, and Hispanics between the 1978 and 1982 NAEPS, Marrett and Matthews et al. reported a consistent pattern of gains for Whites, African Americans, and Hispanic 13 year olds across all four levels of the

assessment: knowledge, skills, understanding, and applications." Moreover, African American and Hispanic 13 year olds did gain more than did Whites - a real and meaningful closing of the gap.

Unfortunately, the results of the 1986 NAEP in mathematics, when compared to the 1978 and 1982 NAEP, revealed a pattern of gains that was limited to African Americans only. Using the 500-point scale developed for the 1986 NAEP, Dossey, et al., reported that across all age levels, African American students scored significantly better in the 1986 NAEP than they did in either 1978 or 1982. Only White 17 year olds gained between the 1982 and 1986 NAEPs; Hispanics showed no significant gains.

A closer analysis of the 1986 NAEP data suggested that African American gains are limited to very basic skills. The percentage of 9 year old African American students exhibiting increases in simple arithmetic facts (NAEP level 200) grew between 1978 and 1986. No such growth was reported in terms of students scoring at or above higher levels. 

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cutoff scores. Since the higher cutoff scores indicate knowledge of more advanced topics, growth for the 9 year old cohort was limited to simple facts and beginning skills.

In sum, the data on whether the gap is being narrowed are mixed. If the gap is truly narrowing, it would seem to be for African Americans only and only on items that reflect low level and basic skills mastery. These are hard earned gains, regardless of their causes.

**Summary of Related Literature**

According to the literature cited above, higher academic achievement is just one result of parental involvement. Various studies have shown that parental involvement also has a strong impact on student’s self esteem, attitude toward school, motivation to learn and reading and mathematics skills.91 Special programs and projects aimed at empowering parents are a most important step to get parents involved in the schools. Projects should be designed to give both students and parents the confidence to become more involved in the educational process and emphasize the parent-student-teacher as a team.

The development of the Family Mathematics Workshop was supported by and is consistent with the theory that when teachers help them, parents of all backgrounds can be

involved productively in their child's educational experience.\textsuperscript{92} Empowering parents is the way to improve parental involvement and thus improve the academic performance of students. In order to bridge the gap between the parent-student and between parent-teacher, parents must be educated. Teachers must assist parents in becoming empowered to create a three-way partnership in order for the student to succeed.

Studies show parents who know their role as a partner in the school are most apt to participate. School systems must give parents a specific understanding of what they need from them and in return provide reasonable and sensible opportunities for the parents to learn and participate. This will emphasize to parents that their support is necessary to influence and motivate the child to learn and become productive academically.\textsuperscript{93} By strengthening the parents' skills and building their self esteem, the parents' apathetic attitudes and behavior will be likely to change. As a result, parents positive attitudes will help the child to become a stronger person and a better learner. Establishing a rapport with parents, enhancing community awareness of parental involvement, and getting parents involved in students' educational and personal growth can help achieve positive outcomes for the entire community.


\textsuperscript{93}J.L. Epstein, \textit{Homework practices}, 1988.
CHAPTER THREE
METHODOLOGY

Research Design

This experimental study was conducted to assess the effects of a Family Mathematics Workshop on African American middle grades students' mathematics achievement and parent child interaction at home with mathematics homework. The experimental design was used to conduct the study. An experimental group and a control group were assigned using matched sampling. The Pretest-Posttest Control Group Design was used.¹ This design is illustrated below:

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>(parent training)</td>
<td>A Y₁</td>
<td>X</td>
<td>Y₂</td>
</tr>
<tr>
<td>(no parent training)</td>
<td>B Y₁</td>
<td></td>
<td>Y₂</td>
</tr>
</tbody>
</table>

(R) A and (R) B represent matched assignment to a group; Y₁ represents the pretest and Y₂ represents the posttest. X represents the treatment. The Iowa Test of Basic Skills spring 1996 and 1997 student scores were used as the pretest and posttest. Five family mathematics

workshops were given to parents and children in the experimental group.

Data Collection

The composite scores of the spring 1996 ITBS served as pretest data for this study, and the composite scores of the spring 1997 ITBS served as posttest data for this study. Data were gathered on students whose parents had volunteered to participate in the Family Mathematics Workshop. The control group was then selected from the remaining fifth grade students by pairing control group students with experimental students on the basis of test scores. This ensured closely comparable groups.

Data Collection Instruments

The Iowa Test for Basic Skills standardized test (ITBS), was the instrument used to collect mathematics achievement data. The ITBS was developed for the following nine purposes:

1. to determine the developmental level of the pupil for instruction;
2. diagnose students' specific strengths and weaknesses;
3. indicate students' specific readiness skills for instruction;
4. provide information for instructional grouping;
5. diagnose group strengths and weaknesses for curriculum change;
6. compare alternative instructional procedures;
7. serve as a dependent variable in experimentation;
8. provide a behavioral model with feedback; and

The students raw scores (the number correct on each subtest) are translated into one or more derived scores, such as percentiles, grade equivalents or normal curve equivalents, which relate the students scores to those of the group on which the test was normed.

The percentile scores of the experimental and control group for the ITBS spring 1996-1997 were used as the pretest and posttest for this study. A percentile score indicates the percentage of students in the norming group who scored lower than a particular score. For example, students who achieve at the median for the norming group (that is, equal numbers of students scored better or worse than that score) would have a percentile rank of 50, because their scores exceeded those of 50 percent of the students in the norming group. If you ranked a group of 30 students from bottom to top on test scores, the 25th student from the bottom would score in the 83rd percentile (25/30 X 100 = 83.3).²

The National Percentile (NP) rank indicates the status of relative standing of a student in comparison to other students at the national level. For example, if a student

earns a percentile rank of 70 on a particular test, NP means that, on the average, that student scored better than 70 percent of the norm group. Norms are based upon a standardization group or a group that is purported to be representative of a much larger population. These norms are thus assumed to be representative of large groups.

An informal survey was used with the experimental group to assess the effects of the Family Mathematics Workshop approach on parent-child interactions with mathematics homework (Appendix C). A Likert scale was used to elicit the before and after responses of the parents. The scales consisted of responses ranging from "a very effective mathematics program" to "not an effective mathematics program"; "very high degree" to "a limited degree"; "never had trouble" to "always had trouble"; etc. (see Appendix C). The mean range for the Likert scale is: \(a=1.00-1.49\); \(b=1.50-2.49\); \(c=2.50-3.49\); \(d=3.50-4.49\); \(e=4.50-5.49\); \(f=5.50-6.00\).

**Research Setting**

The study took place at an elementary school in the DeKalb County School system. This school is located in the Southeastern area of Decatur, Georgia, a suburban area within greater Metropolitan Atlanta, Georgia. DeKalb County has 79 elementary schools, 10 middle schools, and 17 secondary schools. The county serves approximately 90,000 students (Pre-K - 12th grades). Of these, approximately
99.4 percent are from minority races and 42,735 of all students in the county receive free lunch and about 9,877 student receive reduced priced school lunches.

This elementary school serves approximately 850 students in grades Pre-Kindergarten through Sixth. All of the students live within a 2.6 mile radius of the school. The majority of the students come from middle to upper middle socioeconomic backgrounds. Achievement scores on standardized achievement tests are consistently below the national and state averages in all grade levels. Four hundred thirty (430) of the students in the school receive free lunch and eighty-four (84) students receive reduced price school lunches. Ninety-nine and four tenth percent of the students are from minority races. Ninety-seven and five tenth percent of the students are black. At the time of the workshop, there were five fifth-grade teachers. Four of the fifth-grade teachers were black and live in the same Southeastern DeKalb County area as the school community. One of the fifth-grade teachers was White and did not live in the same area as the school.

Subjects / Sampling Procedures and Description

All fifth grade students and their parents were invited to participate in the five workshops. Twenty students and their parents signed up for the workshops. These students and their parents comprised the experimental group. The
control group was selected from the remaining fifth grade students enrolled at this elementary school during the 1996 - 1997 school term. The matched samples method was used to select the control group by matching the 1996 ITBS spring composite pretest scores of the experimental group thus producing closely comparable groups with respect to the ITBS scores.

Treatment

The treatment for the study was an intensive parent training workshop which provided parents with strategies, games and activities to use at home to reinforce mathematics skills that were being covered in their mathematics class at school. The materials used in this study were based on the principles outlined in the Math To Go component of the Houghton Mifflin's Mathematics Program. The Math To Go component was designed to help bridge the gap between home and school in an effort to improve students' mathematics achievement. These materials were developed by the Houghton Mifflin Mathematics Company. These materials also aim to boost families' mathematical confidence, facilitate home communication, family involvement, and improve the parents' understanding of the mathematics curriculum. The Houghton Mifflin rationale for their Math To Go materials states that children's perceived abilities and their goals can be

reflections of family members' attitudes toward mathematics. Math To Go is correlated to the concepts in the students' math textbook. Math To Go provides activities, games and home letters to reinforce skills in each module of the students' mathematics textbook. The schedule and parent letters were modeled after a Family Mathematics Workshop conducted at the University of Southern Mississippi by Chrislyn Zellars Luce in her dissertation.  

Five Family Mathematics Workshops were conducted for the experimental group of twenty fifth-grade students and their parents. The workshops were conducted in the conference room of the community library, located approximately two miles from elementary school where this study took place. A typical session lasted four hours. The workshops were held on the second Saturday of each month starting September 14, 1996, and ran through February 1, 1997, (except for the month of December). The workshops provided parents with instructional techniques, materials, mathematics games and activities to reinforce mathematics concepts at home. Materials were sent home with the families at the end of each session.

Each of the Family Mathematics Workshops included eight mathematics games and four home letters from the Math To Go component of the Houghton Mifflin's Mathematics Program. The topics of the games correlated with mathematics concepts

in the module that were covered in the student text for that month. The parents and students took these games and were instructed to continue playing them each week at home.

Prior to the Workshops

Table 1. Schedule and Topics for Workshops for Experimental Group

<table>
<thead>
<tr>
<th>Dates</th>
<th>Module</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/14/96</td>
<td>Module 1</td>
<td>Sections A-D (Patterns and Designs)</td>
</tr>
<tr>
<td>10/12/96</td>
<td>Module 2</td>
<td>Sections A-D (Getting a Handle on Numbers)</td>
</tr>
<tr>
<td>11/09/96</td>
<td>Module 3</td>
<td>Sections A-D (Getting Your Money’s Worth)</td>
</tr>
<tr>
<td>01/11/97</td>
<td>Module 4</td>
<td>Sections A-D (One World Many Parts)</td>
</tr>
<tr>
<td>02/01/97</td>
<td>Module 5</td>
<td>Sections A-D (Faster, Higher, Stronger)</td>
</tr>
</tbody>
</table>

Family Mathematics Workshop Guidelines:

1. Students must have a parent with them when they attend each workshop.
2. Attendance records will be kept.
3. Attending less than four (4) workshops, the student’s name will be dropped from the list.
4. Mathematics games and activities will be discussed and played.
5. Mathematics concepts will be discussed.
The Mathematics Workshops will focus on applying mathematics concepts in everyday activities.

The Constructivist Teaching Model will be modeled in each workshop.

All games and materials will be sent home at the end of each workshop.

Students and parents will be asked to continue to play the games each week at home.

All of the fifth grade students and their parents received information describing the Family Mathematics Workshop program which was entitled, "Family Mathematics on the Go." In addition to the descriptive information, parents received a contract stating their intentions to participate in the program. Parent participants who signed the contract agreed to attend four of the five workshops. Students who did not return contracts did not participate in the study. Students in the control group did not attend any of the workshops, obtain any instruction in the Math To Go games and activities or receive any materials used with the experimental group.
CHAPTER FOUR
ANALYSES OF THE DATA

Introduction

The purpose of this study was to determine the effects of the Family Mathematics Workshop approach on middle grades African American students' mathematics achievement and parent-child interaction with mathematics homework. The mean achievement pretest scores from the 1996 and 1997 Iowa Test of Basic Skills (ITBS) of students in the treatment and control groups were compared using a one way analysis of variance. Parents and students of the experimental group completed an informal survey measuring parent-child interactions with mathematics homework and attitudes toward their child's mathematics educational program.

Two hypotheses were tested: H1 states that there is no significant difference in mathematics achievement as measured by the Iowa Test of Basic Skills (pretest 1996 and posttest 1997), of African American children whose parents participated in a Family Mathematics Workshop and those of African American children whose parents did not participate. H2 states that there is no significant difference in the parent/child interaction of the experimental group with
mathematics homework after the workshop than before the workshop.

Descriptive Data

Permission letters were sent to parents of all fifth grade students at Chapel Hill Elementary. Of the 125 students in fifth grade, 28 (22 percent) returned the forms indicating that they were willing to participate in the Saturday workshops. Of the 28 students in the experimental group, 6.4 percent (8 students) did not attend at least four of the five workshops and were subsequently dropped from the study. Of the 20 students who remained in the study, there were eight males and twelve females. Table 2 illustrates group membership.

At the completion of the last workshop, all parents of students in the experimental group received an informal instrument measuring their involvement with their child's mathematics homework before and after the Family Mathematics Workshops and their attitudes regarding the workshops. Each family received only one instrument, even if both parents attended the workshops. Of the 20 that were sent home, only 12 were returned, yielding a response rate of 60 percent.
Table 2. Summary of Group Membership

<table>
<thead>
<tr>
<th>Subjects</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade:</td>
<td></td>
</tr>
<tr>
<td>Fifth</td>
<td>40</td>
</tr>
<tr>
<td>Group:</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>20</td>
</tr>
<tr>
<td>Control</td>
<td>20</td>
</tr>
</tbody>
</table>

Results of Data Analyses

Null hypotheses #1, There is no significant difference in mathematics achievement as measured by the Iowa Test of Basic Skills (pretest 1996 and posttest 1997), of African American children whose parents participated in a Family Mathematics Workshop and those of African American children whose parents did not participate was tested using the one way analysis of variance.
Table 3. Results of Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of D.F.</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1</td>
<td>469.2250</td>
<td>469.2250</td>
<td>1.6060</td>
<td>.2128</td>
</tr>
<tr>
<td>Within Groups</td>
<td>38</td>
<td>11102.5500</td>
<td>292.1724</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>11571.7750</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>Count</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>20</td>
<td>5.2500</td>
<td>19.8809</td>
<td>4.4455</td>
</tr>
<tr>
<td>Group 2</td>
<td>20</td>
<td>-1.6000</td>
<td>13.7512</td>
<td>3.0749</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>1.8250</td>
<td>17.2253</td>
<td>2.7236</td>
</tr>
</tbody>
</table>

Group 1: Experimental Group; Group 2: Control Group

Table 3 shows the results of the one way analysis of variance. The computed F-ratio (1,38) of 1.606 when compared to the critical value of 4.10 was not significant at the .05 level. Therefore, the null hypothesis was not rejected. Null hypotheses #2, There is no significant difference in the parent/child interaction of the experimental group with mathematics homework after the workshop than before the workshop was tested using a Likert Scale to elicit the before and after responses of the parents of the experimental group. An informal survey was
given to the parents of the experimental group to determine if the Family Mathematics Workshop Approach was effective in increasing parent/child interaction with mathematics homework. Statistically there was no significant difference found in the amount of time that parents in the treatment group spent assisting their child with their homework before and after the workshop. Some of the responses however, suggested that the workshop did influence parent/child interaction, such as Item #6 - How often do you play mathematics games as a family? The following responses were given by the parents returning surveys: before the workshop 50 percent said 0 times per week; after the workshop only 30 percent said 0 times per week. Item #8 - We understand the lessons and assignments that are presented in our child’s Houghton Mifflin mathematics book. Before the workshop, 50 percent responded that they understood the lessons and assignments to a limited degree. After the workshop, 60 percent said they understood to a moderate degree and 30 percent said to a high degree. Item #12 - Do you have confidence in your ability to help your child with their mathematics homework? Before the workshop, parents gave the following responses: 30 percent said to a limited degree, 40 percent said to a moderate degree, and 10 percent said to a high degree. After the workshop, the responses were as follows: 60 percent said to a moderate degree, 20 percent
said to a high degree, and 10 percent said to a very high degree.

Table 4. T-test for Paired Samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pairs</th>
<th>Corr</th>
<th>Sig.</th>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>After</td>
<td>10</td>
<td>.695</td>
<td>.026</td>
<td>2.573</td>
<td>.736</td>
<td>.233</td>
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<tr>
<td>Before</td>
<td></td>
<td></td>
<td></td>
<td>3.053</td>
<td>.669</td>
<td>.211</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean Differences</th>
<th>Paired SD</th>
<th>SE of Mean</th>
<th>t-value</th>
<th>DF</th>
<th>2-tail Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.4800</td>
<td>.552</td>
<td>.175</td>
<td>-2.75</td>
<td>9</td>
<td>.023</td>
</tr>
</tbody>
</table>

95% CI (-.875, -.085)

table value = 2.262

The calculated t-value (2.75) is greater than the table value (2.262) so the null hypothesis is rejected (Table 4). However, statistically, the level of confidence is lowered because of the small sample size.
CHAPTER FIVE

SUMMARY, CONCLUSIONS, DISCUSSION, IMPLICATIONS
AND RECOMMENDATIONS

Summary and Conclusions

This study was designed to assess the effects of a Family Mathematics Workshop on African American middle grades students' mathematics achievement and on parent-child at home interactions with mathematics school work. The subjects in the study included two student groups of twenty fifth grade students each -- a control and an experimental group -- and parents of twenty children in the experimental group volunteered to attend at least four of five Saturday workshops designed to instruct parents on ways to help their children in mathematics. All students attended an elementary school in the DeKalb County School System located in Decatur, Georgia, during the study period. The treatment was administered over five Saturdays during the fall of 1996. Data were collected using the Iowa Test of Basic Skills (pretest spring 1996 and posttest spring 1997) and an informal parent survey.

The results of the Iowa Tests were analyzed using a one-way analysis of variance procedure, with the .05 level of significance established to test the hypotheses. The
t-test was used to analyze data from the informal parent inventory.

This study attempted to answer the following questions: 1) What are the effects of a Family Mathematics Workshop on middle grades African American students’ mathematics achievement?; and 2) Do parents indicate on an informal survey that the Family Mathematics Workshop increased parent/child interactions at home with school work? This study hypothesized that there would be no significant difference in mathematics achievement as measured by the *Iowa Test of Basic Skills* (pretest 1996 and posttest 1997) of African American children whose parents participated in a Family Mathematics Workshop and those of African American children whose parents did not participate. This study further hypothesized that there would be no significant difference in the parent/child interaction of the experimental group with mathematics homework after the workshop than before the workshop. Neither null hypothesis was rejected.

Since results of the empirical study do not refute the null hypothesis, it was concluded that parents and children’s participation in mathematics workshops did not effect children’s mathematics achievement or the at-home parent-child interactions.
Discussion and Implications

Many African American parents may be complacent about the low performance of their children in mathematics for various reasons. One reason may be that because of their unsuccessful educational experiences in mathematics, they feel their children have inherited poor mathematics skills. Another reason may be that they lack directions regarding strategies to help their children. A report completed at John Hopkins University, in 1983, stressed that parents already help their children; only 20 percent reported that they never help their children with reading or mathematics skills during the school year.\(^1\) Hence, family mathematics workshops would be a method to show parents effective ways to teach their children. Research showed that African American parents have low expectations for their children in mathematics. These low expectations may stem from the fact that they are not cognizant of the skill levels required for their children to be competitive with their peers, not just in this nation, but globally.

The family mathematics workshop is a method to inform African American parents of the skills and thinking level required for children to be proficient in mathematics. Research suggested that parents can be a valuable resource to the classroom teacher. Myers points out that parents can

be trained for whatever task needs to be done. A Family Mathematics Workshop would provide guidance to parents involved in their children’s mathematics educational process. This will allow the parents and students to learn from each other as they progress through activities.

The workshops were conducted in only five four-hour sessions. This was a relatively short period of time which may not have been adequate to have a significant impact on parental influence. The research literature does suggest that parent/child interaction increases with greater parental involvement. Epstein’s theory of overlapping spheres of influences of families and schools on students’ learning and development and on family and school effectiveness proposes that when the school and family unite in a partnership for children, their overlapping spheres of influence foster a positive attitude about mathematics at home that helps children learn mathematics at school. He listed several benefits from greater overlapping. For example, when teachers make parent involvement part of their regular teaching practice: (a) parents increase their interactions with their children at home; (b) parents feel more positive about their abilities to help their children in the elementary grades; (c) parents rate the teachers

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higher overall; and (d) students improve their attitudes and achievement."

Further, response patterns from the informal survey suggested that the Family Mathematics Workshop approach did have a positive impact on parent-child interaction with homework.

There is an ever increasing demand for a workforce that is prepared to meet the demands of a technologically dependent world. The African American student is not and will not be prepared to enter this labor market, if current trends in minority mathematical achievement persist.

Although student test scores were not significantly affected, parental assistance of students in their mathematics studies did rise. The workshops were important and may have long term benefits as parents:

- recognize disenchantment in the study of mathematics by their children;
- become aware of low expectations of student performance held by parents, teachers, and by students;
- diagnose low self-esteem and self confidence which undermines student motivation;
- identify inadequate student preparation in mathematics;

- learn the mathematical knowledge and skills required at their children’s grade level and use this information to assess student and teacher performance;
- become cognizant that mathematics is crucial to success in education, vocation, and personal life;
- learn that mathematics is a continuous process where the preceding level or element is a part of the foundation for advanced courses;
- become proactive in obtaining help for children having difficulties with mathematics - tutors, workshops, seminars, etc.

Mathematics test scores may yet rise over the intermediate to long term time frame as workshops teach parents and/or students to recognize deficiencies and attempt to provide corrective solutions.

The future ability of the United States to continue to compete with other technologically advanced countries in global markets lies in the capabilities, knowledge, and skills of its human resources. Therefore, it is to everyone’s benefit to prepare non-Asian minority students (Blacks, Hispanics, and Native Americans) who, demographically, will be in the majority in the twenty-first century, to meet the future demands of the job market, thus guaranteeing these pupils tools to achieve a decent standard
of living. The nation must strive to insure that its human resources are developed to the fullest.

Teachers and parents of African American students need to set higher expectations for these students in mathematics, and the community as a whole should adopt programs that encourage the students to strive for excellence in mathematics.

Recommendations

Previous research on parental involvement in the educational process indicates positive impacts on students' achievement. Epstein's model of family-school relations reflects the fact that at any time, in any school, and in any family, parent involvement is a variable that can be increased or decreased by the practices of teachers, administrators, parents, and students. Programs and practices can be designed, revised, and evaluated to learn which variations produce greater school and family effectiveness and student success. This study was also limited by a sample size of only 20 fifth grade students in the experimental and control groups, respectively.

Based on the findings and conclusions of this study, the following recommendations were made:
1. Further research is needed in assessing the long term effects of parental participation in the Family

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"J.L. Epstein, "Toward a theory of family and school connections," 1987."
Mathematics Workshop approach on students' achievement in mathematics.

2. Research is needed using a larger sample size analyzing the effects of participation in a Family Mathematics Workshop.

3. Research is needed using the Family Mathematics Approach assessing the long term effects of participation in the Family Mathematics Workshop continuously throughout the school year.

4. Individuals and groups of students should be required to attend family mathematics workshops after having been diagnosed with a weakness in a specific mathematics concept or strand.

5. Schoolwide policies should be established to require parent involvement as a major focus for bringing about student achievement changes in mathematics.

6. Teachers should be trained to effectively implement parent involvement to provide parents guidance with helping their children with mathematics homework.

7. Incentives should be given to parents and teachers to encourage effective parent involvement practices in mathematics.

8. Parents should be recognized and awarded for consistent involvement in helping their children with mathematics homework.
9. **Family Mathematics Workshops** should be made available to all parents to guarantee support and guidance for parents with their children’s mathematics school work.
Dear Parents:

My name is [presenter's name]. I serve as the Mathematics Specialist here at [name of school]. This school term, I am providing a very special opportunity for you and your child. On Saturday, September 28th, from 1:00 pm until 5:00 pm, I will start the first of a series of five Family Mathematics Workshops. I will sponsor these workshops to acquaint parents with mathematics materials that the children are learning. A variety of games will be offered each evening. You and your child will come together and play several educational games. The games will then be given to your child to keep and it's absolutely FREE!!! You will walk away knowing that your child benefitted from the experience.

The first Family Mathematics Workshop is Saturday, September 28th at the [name of meeting place]. To attend, you MUST sign up in advance. Space is limited so I am asking that you return this paper as soon as possible. The purpose of the Family Mathematics Workshops is to spark your child's interest in mathematics, to teach concepts that children will need to know in their future careers, to increase grades, and to help parents understand how to help their children with today's changing curriculum. I need your help!!! I believe that every fifth grade child will benefit from the program if he or she attends several of the workshops. I know that you may not be able to attend every session. However, I'm asking that you commit yourselves to attending at least four (4) of the five sessions. I urge you to do this for your child. I know that after attending the first Family Mathematics Workshop, you will be so excited that you will not want to miss another.

Parents, please note that you do not need to be good in mathematics to be able to attend. The games to be played are easy for adults yet challenging for your children. Please attend regardless of how you or your child feels about mathematics. I believe that you will leave the program asking when we can offer it again.

I hope that every parent will be able to come. The deadline to sign up is Tuesday, September 10th. However, I am asking that you sign up as soon as possible so I can get an idea of how many games I will need. So please hurry and complete the attached sign up sheet.

Because the program is offered for four hours I am offering light refreshments (cookies and punch) during a 15 minute break at each workshop. I am looking forward to seeing you soon!

Sincerely,
PLEASE RETURN THIS PAPER TO YOUR CHILD’S TEACHER

The schedule of all Family Mathematics Workshops is listed below: All of the Family Mathematics Workshops will be held at the (name of meeting location).

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop 1</td>
<td>September 28th</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 2</td>
<td>October 12th</td>
<td>1:00 - 4:30</td>
</tr>
<tr>
<td>Workshop 3</td>
<td>October 26th</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 4</td>
<td>November 2nd</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 5</td>
<td>November 23rd</td>
<td>1:00 -5:00</td>
</tr>
</tbody>
</table>

If you are interested in attending, please sign below and return this paper as soon as possible.

If you have any questions, please contact your child’s teacher. I am looking forward to seeing each of you on September 28th at the (name and address of meeting place).

Yes, I want to be a part of the Family Mathematics Workshops offered by (name of presenter). I understand that I am expected to attend the program with my child and agree to attend at least 4 of the five Saturday workshops. My child will keep all games played.

Parent’s Name ___________________________
Child’s Name ___________________________
Child’s Age _______ Birth date ___________
Homeroom Teacher ________________________
Dear Parents,

I would like to thank you for your interest in the Family Mathematics Workshops. You have taken a positive step in helping your child excel in mathematics. The response to the program has been overwhelming. I had more people ask to participate than I could work with at this time. Therefore, I had to draw names and divide the students into two sessions. Your child was chosen to attend the second session which will begin after spring break. I hope that this does not inconvenience you. More information on the exact date will be sent home in March. I am looking forward to seeing you then.

Sincerely,
To the parents of ____________________________:

Dear Parents,

I would like to thank you for your interest in the Family Mathematics Workshops. The response to the program has been overwhelming. I had more people ask to participate than I could work with at this time. Therefore, we had to draw names and divide the students into two sessions. Your child was chosen to attend this first session. We will meet at the (address where the workshops will meet) at 1:00 pm on Saturday, September 28th. I will have several games ready to play. I am looking forward to seeing you there.

Sincerely,

Please post this on your refrigerator!!

The schedule of all Family Mathematics Workshops is listed below:

<table>
<thead>
<tr>
<th>Workshop 1</th>
<th>September 28th</th>
<th>1:00 - 5:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop 2</td>
<td>October 12th</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 3</td>
<td>October 26th</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 4</td>
<td>November 2nd</td>
<td>1:00 - 5:00</td>
</tr>
<tr>
<td>Workshop 5</td>
<td>November 23rd</td>
<td>1:00 - 5:00</td>
</tr>
</tbody>
</table>
## APPENDIX B

### Experimental Group ITBS Scores

#### 1995 - 96

<table>
<thead>
<tr>
<th>Student #</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91%</td>
</tr>
<tr>
<td>2</td>
<td>88%</td>
</tr>
<tr>
<td>3</td>
<td>85%</td>
</tr>
<tr>
<td>4</td>
<td>74%</td>
</tr>
<tr>
<td>5</td>
<td>71%</td>
</tr>
<tr>
<td>6</td>
<td>60%</td>
</tr>
<tr>
<td>7</td>
<td>53%</td>
</tr>
<tr>
<td>8</td>
<td>48%</td>
</tr>
<tr>
<td>9</td>
<td>43%</td>
</tr>
<tr>
<td>10</td>
<td>38%</td>
</tr>
<tr>
<td>11</td>
<td>28%</td>
</tr>
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<td>12</td>
<td>24%</td>
</tr>
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<td>13</td>
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<tr>
<td>19</td>
<td>12%</td>
</tr>
<tr>
<td>20</td>
<td>6%</td>
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</table>

#### 1996 - 97

<table>
<thead>
<tr>
<th>Student #</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>86%</td>
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<tr>
<td>2</td>
<td>88%</td>
</tr>
<tr>
<td>3</td>
<td>77%</td>
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<td>4</td>
<td>81%</td>
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<tr>
<td>19</td>
<td>3%</td>
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<tr>
<td>20</td>
<td>7%</td>
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### Control Group ITBS Scores

#### 1995 - 96

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<th>Scores</th>
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</thead>
<tbody>
<tr>
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<td>90%</td>
</tr>
<tr>
<td>2</td>
<td>82%</td>
</tr>
<tr>
<td>3</td>
<td>81%</td>
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<td>4</td>
<td>73%</td>
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<td>60%</td>
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<td>6</td>
<td>60%</td>
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<td>55%</td>
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<td>26%</td>
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<td>18%</td>
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<td>13%</td>
</tr>
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<td>18</td>
<td>11%</td>
</tr>
<tr>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>20</td>
<td>8%</td>
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</tbody>
</table>

#### 1996 - 97

<table>
<thead>
<tr>
<th>Student #</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
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<td>93%</td>
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<tr>
<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>79%</td>
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<td>5</td>
<td>46%</td>
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<td>60%</td>
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<td>58%</td>
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<td>52%</td>
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<tr>
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<td>14%</td>
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<td>60%</td>
</tr>
<tr>
<td>11</td>
<td>45%</td>
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<td>12</td>
<td>14%</td>
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<td>13</td>
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<td>14</td>
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<td>17</td>
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<td>18</td>
<td>4%</td>
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<td>19</td>
<td>27%</td>
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<tr>
<td>20</td>
<td>7%</td>
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</tbody>
</table>
APPENDIX C

PARENT QUESTIONNAIRE

DIRECTIONS: Read the following and select only one answer for each question. Your answers will be kept anonymous.

1.) We feel the Houghton Mifflin mathematics program is

<table>
<thead>
<tr>
<th>My opinion before attending the Family Math Workshop:</th>
<th>My opinion after attending the Family Math Workshop:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.) a very effective math program</td>
<td>a.) a very effective math program</td>
</tr>
<tr>
<td>b.) an effective math program</td>
<td>b.) an effective math program</td>
</tr>
<tr>
<td>c.) a moderately effective math program</td>
<td>c.) a moderately effective math program</td>
</tr>
<tr>
<td>d.) an effective math program</td>
<td>d.) an effective math program</td>
</tr>
<tr>
<td>e.) not an effective math program</td>
<td>e.) not an effective math program</td>
</tr>
</tbody>
</table>

2.) We feel our child

<table>
<thead>
<tr>
<th>My opinion before attending the Family Math Workshop:</th>
<th>My opinion after attending the Family Math Workshop:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.) never had any trouble</td>
<td>a.) never has any trouble</td>
</tr>
<tr>
<td>b.) seldom had trouble</td>
<td>b.) seldom has trouble</td>
</tr>
<tr>
<td>c.) occasionally had trouble</td>
<td>c.) occasionally has trouble</td>
</tr>
<tr>
<td>d.) always had trouble</td>
<td>d.) always has trouble</td>
</tr>
</tbody>
</table>

understanding and completing math homework assignments.

3.) We feel our child has

<table>
<thead>
<tr>
<th>My opinion before attending the Family Math Workshop:</th>
<th>My opinion after attending the Family Math Workshop:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.) very good confidence in his/her math ability</td>
<td>a.) very good confidence in his/her math ability</td>
</tr>
<tr>
<td>b.) good confidence in his/her math ability</td>
<td>b.) good confidence in his/her math ability</td>
</tr>
<tr>
<td>c.) average confidence in his/her math ability</td>
<td>c.) average confidence in his/her math ability</td>
</tr>
<tr>
<td>d.) poor confidence in his/her math ability</td>
<td>d.) poor confidence in his/her math ability</td>
</tr>
</tbody>
</table>

4.) When completing math homework, our child

<table>
<thead>
<tr>
<th>My opinion before attending the Family Math Workshop:</th>
<th>My opinion after attending the Family Math Workshop:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.) never showed anxiety</td>
<td>a.) never shows anxiety</td>
</tr>
<tr>
<td>b.) seldom showed anxiety</td>
<td>b.) seldom shows anxiety</td>
</tr>
<tr>
<td>c.) occasionally showed anxiety</td>
<td>c.) occasionally shows anxiety</td>
</tr>
<tr>
<td>d.) always showed anxiety</td>
<td>d.) always shows anxiety</td>
</tr>
</tbody>
</table>
5.) On an average, our child would have adult supervision with math homework

My opinion before attending the Family Math Workshop:
- a.) less than one hour per day
- b.) one hour per day
- c.) two hours per day
- d.) three hours per day
- e.) more than three hours per day

My opinion after attending the Family Math Workshop:
- a.) less than one hour per day
- b.) one hour per day
- c.) two hours per day
- d.) three hours per day
- e.) more than three hours per day

6.) We play math games as a family

My opinion before attending the Family Math Workshop:
- a.) more than 3 times per week
- b.) 3 times per week
- c.) 2 times per week
- d.) 1 time per week
- e.) 0 times per week

My opinion after attending the Family Math Workshop:
- a.) more than 3 times per week
- b.) 3 times per week
- c.) 2 times per week
- d.) 1 time per week
- e.) 0 times per week

7.) Our child had fun playing the math games

My opinion before attending the Family Math Workshop:
- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

My opinion after attending the Family Math Workshop:
- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

8.) We understand the lessons and assignments that are presented in our child’s Houghton Mifflin Math Book

My opinion before attending the Family Math Workshop:
- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

My opinion after attending the Family Math Workshop:
- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree
9.) We have high expectations in our child’s ability to be successful in mathematics.

*My opinion before attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

*My opinion after attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

10.) We keep up to date in what our child is learning in his/her regular math class

*Our opinion before attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

*My opinion after attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

11.) We are involved in providing assistance to our child with math homework

*My opinion before attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

*My opinion after attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

12.) We have confidence in our ability to help our child with his/her math homework

*My opinion before attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree

*My opinion after attending the Family Math Workshop:*

- a.) very high degree
- b.) high degree
- c.) moderately degree
- d.) undecided
- e.) limited degree
17.) We most likely will use the Math To Go activities since participating in the Family Math Workshop than if we had not participated
a.) very high degree
b.) high degree
c.) moderate degree
d.) undecided
e.) limited degree
f.) no degree

18.) The Math To Go materials provided with a resource of games to use to reinforce skills that were covered in our child’s regular math class
a.) very high degree
b.) high degree
c.) moderate degree
d.) undecided
e.) limited degree
f.) no degree

19.) The Math To Go materials proved to be an important resource in helping our understanding of mathematical terms on homework assignments
a.) very high degree
b.) high degree
c.) moderate degree
d.) undecided
e.) limited degree
f.) no degree

20.) The Family Math Workshop provided experiences that connected math concepts to everyday situations
a.) very high degree
b.) high degree
c.) moderate degree
d.) undecided
e.) limited degree
f.) no degree
13.) Our child had/has confidence in his or her math ability to a
   My opinion before attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

   My opinion after attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

14.) Our child is motivated in the area of mathematics
   our opinion before attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

   My opinion after attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

15.) Our child’s math grades reflect his/her level of performance in mathematics to a
   My opinion before attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

   My opinion after attending
   the Family Math Workshop:
   a.) very high degree
   b.) high degree
   c.) moderately degree
   d.) undecided
   e.) limited degree

16.) The math games and activities learned at the Family Math workshop helped our child understand math concepts to a
   a.) very high degree
   b.) high degree
   c.) moderate degree
   d.) undecided
   e.) limited degree
   f.) no degree
Math to Go Activity

Fifth graders are learning how to find the perimeter (distance around) and area (space enclosed) of rectangles. They find the perimeter either by adding all four sides or by adding the length and the width and doubling the sum. They find the area by multiplying the length by the width.

We are surrounded by rectangles—walls, floors, windows, doors, tabletops, counters, cards, gardens, rugs, picture frames, and so forth. We often have reason to calculate perimeters and areas of these common rectangles. Here is a game that will give your child practice calculating both areas and perimeters of rectangles, and then comparing their numerical values.

Materials: Paper clip, spinner (below), paper, pencil. To use the spinner, place the point of a pencil inside one end of the paper clip and on the center of the spinner. Spin the paper clip around the pencil point with your finger.

Rules:
1. Player 1 spins the spinner two times to get the length and width of a rectangle. He or she calculates both the perimeter and the area. If the perimeter number is greater than the area number, Player 1 gets 2 points. If the area number is greater than the perimeter number, 1 point is subtracted from any score the player has. If the area and perimeter numbers are equal, the player wins a bonus of 5 points.

2. Player 2 now follows the same procedure. They take turns until one of them wins by getting 10 points.
Fifth graders are learning to read and write large numbers. They read 3,567,102 as three million, five hundred sixty-seven thousand, one hundred two. This is a game in which your fifth grader will practice writing large numbers and comparing them to decide which is the greatest.

Materials: 2 paper clips, 2 spinners (below), paper, pencil. To use the spinner, place the point of a pencil inside one end of the paper clip and on the center of the spinner. Spin the paper clip around the pencil point with your finger.

Rules:

1. Player 1 spins both spinner 1 and spinner 2 and writes the number, adding any necessary zeros to the right. For example, if the spins are 4 and thousands, the player writes 4,000.

2. Player 2 does the same.

3. On the next turn, Player 1 tries to build on to the left of the number already written, adding zeros between the two numbers if necessary. For example, if Player 1 spins 218 and millions, and had already written the number 4,000, the new number could be built on to the existing number to make 218,004,000. If building on is not possible, the player starts a second number, and thereafter can build on to either of them.

4. Play continues in this way, with each player trying to build the greatest number possible.

5. After 10 turns each, the player who has built the greatest number wins.
Math to Go Activity

To explore number patterns, our math class has learned to play the Maze Game. You and your fifth grader can have fun playing this game, and it will help your student understand what an equation is—a number sentence stating that two quantities are equal. The object of this game is for one player to set up a pathway through the gameboard and then for another player to describe the path by writing an equation. Finding number patterns and writing number sentences is an important math skill in algebra.

Materials: A hundred chart (Activity Worksheet 1) to be used as a gameboard; 10 counters, such as dried beans, buttons, or pennies

Rules:

1. Player 1 chooses a starting square and an escape square and places a counter on each.
2. Player 1 places more counters on the gameboard to represent the turning points of the path through the maze.
3. Player 2 writes an addition equation, or number sentence, to show what is added to each turning point to get to the next. For example, the equation for the maze at right would be: \(1 + 30 + 2 + 20 + 3 + 40 + 1 = 97\)
4. Player 2 follows the same steps as Player 1. This time Player 1 writes the equation.
5. Play this game several times to give both players practice creating a maze and describing the pathway out by writing an equation.
Math to Go Activity

Fifth grade math students are learning that factors of a number are numbers such that when multiplied together their product is the original number. They are also learning that if a number is divided by one of its factors, the answer will be the other factor, with no remainder. For example, if 4 is one factor of 12, another is 12 ÷ 4, or 3.

This is a game you can play with your fifth grader that will give him or her practice in mentally dividing numbers by one factor to find another.

Materials: Paper clip, spinner (below), paper, pencil. To use the spinner, place the point of a pencil inside one end of the paper clip and on the center of the spinner. Spin the paper clip around the pencil point with your finger.

Rules:

1. Player 1 spins the spinner and writes a factor of the number spun. Player 2 must divide the number spun by the factor in order to determine the other factor. This should be done mentally, if possible, and then checked either with paper and pencil or with a calculator.

2. If Player 2 was successful, Player 2 gets a point. Otherwise, Player 1 gets a point. If the factor named by Player 1 was not really a factor, Player 1 loses a point.

3. Now Player 2 spins a number and names a factor of it for Player 1 to mentally divide into the number spun.

4. Play continues in this way until one player wins by getting 10 points.
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