

PARENT TUTORING: IMPLEMENTATION AND ANALYSIS
OF A MODEL FOR LOW-ACHIEVING MATHEMATICS STUDENTS

by

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PARENT TUTORING: IMPLEMENTATION AND ANALYSIS OF A MODEL FOR LOW-ACHIEVING
MATH STUDENTS

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ABSTRACT

Recent research has indicated that parental involvement in instructional activities positively influences student educational achievement. There has been little research, however, which has studied specific types of home-learning programs and their impact on children's academic achievement. In terms of practice, two major surveys of teachers and parents indicated a strong belief and interest in the value of home-learning assistance, but uncertainty as to how successfully to develop and implement such programs. Research also indicates that those programs in existence concentrate mainly on primary students and reading.

With this background in mind, a home-tutoring program for low and low-average achieving intermediate mathematics students was implemented and studied in a suburban elementary school setting. The purpose of the study was two-fold; to determine whether or not a home-tutoring program would increase the achievement of these students and prove efficacious to parents and teachers. If so, the program provides parents and teachers with a model for a viable home-school academic partnership involving intermediate students.

Based on pre-test scores and supporting criteria, the lower-achieving students from three intermediate classes were randomly placed into experimental and control groups. Parents of the students in the experimental group took part in introductory and evaluation meetings and two training workshops. Teachers planned the workshops

collegially and conducted the parent training workshops. Students were tutored at home three times per week for four weeks. The researcher acted in the role of program co-ordinator.

Both qualitative and quantitative data were collected throughout the program. Qualitative data consisted of notes taken during parent meetings and workshops, tape-recorded information from teacher meetings, and parental notes and comments. Quantitative data were collected from pretest and posttest results, participant questionnaires and tutoring and student absence records.

Analysis of the data revealed that the tutored group had made statistically significant gains. An investigation of the questionnaires and qualitative data revealed that participants found the program to be efficacious. Some secondary benefits which emerged were greater student confidence toward mathematics and enhanced teacher collegiality and parent/teacher communication. Parents reported an improved working relationship with their children and increased understanding of curriculum and learning strategies.

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CHAPTER ONE: INTRODUCTION

Rationale

This research project set out to determine whether or not parent tutoring would increase the academic achievement of low-achieving mathematics students. The value of parental involvement in schools has been the subject of an extensive body of research during the past twenty years. Specifically, the question of whether or not parental involvement in the school positively influences student achievement has been clouded by contradictory findings. Fullan (1982) attributes this confusion to the failure of research to distinguish between different types of parent involvement and their subsequent consequences on students' educational attainment. Using Fantini's (1980) compilation of the literature and other studies, Fullan defines four types of parental involvement. He draws upon recent, more focused studies to conclude that "only...direct parent involvement in instructional activities designed to contribute to child development (namely at school as aides or at home as tutors) consistently influence(s) educational achievement of students" (p. 196).

If, as Fullan (1972) states, "Compared to other factors, the family environment...has the strongest effect on children's education" (p. 205), then it would follow that, if teachers were able to modify or use this environment to reinforce specific curriculum objectives, this effective and under-utilized resource should increase student achievement. A decision was made, therefore, to develop and implement

a parent tutoring program at a suburban elementary school to determine whether or not, in fact, this premise was true.

Background

Research

Prior to developing a tutoring program, it seemed pertinent to address the following question: if researchers had found parent tutoring programs to be successful in increasing student academic learning, were such programs being utilized extensively in our schools and, if not, why not? Becker and Epstein (1982), in their extensive state-wide survey of 3700 Maryland public elementary teachers measured teacher feelings about parental involvement in home learning and the breadth of their use of this strategy. They found that, although many teachers believe parental involvement at home could be an important contributor toward achieving classroom goals, only a minority of teachers actually initiated interactions with parents beyond what is traditionally expected of them (i.e., parent conferences, parent nights). Becker and Epstein concluded that, while many teachers believe in the efficiency of parent-tutoring they "do not know how to initiate and accomplish the programs of parent involvement that would help them most" (p. 88).

Interestingly, it would seem that parents' expressed needs and subsequent perceived barriers to home involvement in their children's learning mirror those of teachers. Bridge (1976), citing the Sixth Annual Gallup Poll of Public Attitudes Toward Education, states that

when parents were asked what kind of information (about schools) would be of particular interest to them, "the most frequent answer was 'information about curriculum'" (p. 298). Curriculum was defined in the broad sense "to include the emphases which are placed on different skills (i.e., what is taught) as well as instructional methods which are used (i.e., how it is taught)" (p. 302). Fullan's review (1982) compiled the findings of many researchers (Beveridge & Jerrams, 1981; Lightfoot, 1978; Sharp & Green, 1975) to illustrate that parents, although they are interested in collaborative efforts which would support their children's learning, do not involve themselves because they do not know 'how' to help (p. 204).

Another consideration in developing this model was that traditionally, parent tutoring programs in existence had mainly concentrated on primary students and the subject of reading (Collins, Moles, & Cross, 1982; Epstein, 1984a, 1984b; and Moles & Collins, 1981). These researchers found that parents were interested in working with their older children in other subjects such as mathematics, but that they didn't always have the knowledge to do so. Epstein (1984a) suggests that "teachers may need to give more attention to helping parents of older children learn how to help their children in math at home" (p. 13).

There were, then, three research-based influences which guided the development of this parent-tutoring model: firstly, teachers' and parents' interest in a home-school learning partnership; secondly, their collective uncertainty about how to accomplish their role in

such a partnership; and lastly, the relative absence of home tutoring programs in mathematics and for intermediate grades.

Guidelines for Model

Several researchers have developed guidelines for successful parent-involvement programs (Bridge, 1976; Epstein & Becker, 1982; Fullan, 1982). For the purposes of this research model the guidelines were combined and edited to include those which were relevant to parent-tutoring programs.

1. Start small with a specific target group.
2. Establish linkages with other teachers, where possible.
3. Be sensitive to time demands of both teachers and parents and provide opportunities to "bridge" school and home environments.
4. Establish specific roles and responsibilities of teachers, parents and students.
5. Incorporate clear program focus, goals and objectives.
6. Ensure clear understanding of specific activities and subsequent behaviour expectations.
7. Develop a plan of implementation.
8. Provide a process of evaluation which includes monitoring and tailoring.

School Setting

Utilizing both research background information and the preceding guidelines, a specific model was developed to meet the learning needs of intermediate low and average achieving mathematics students in a suburban elementary school of 340 students. The school, during the

1985/1986 academic year, had identified students requiring mathematics remediation not available through district or school resources. This identification came about as the follow-up to a concern expressed by staff and administration, during a school-wide mathematics articulation process, that the needs of remedial students were not being met. A decision was made to identify the students and see if a creative in-school solution could be found to address the problem. The model used in this research project was developed to provide a viable strategy for increasing the mathematics success of these students.

In order to obtain a sufficient number of students to satisfy both the experimental and control group requirements of the research project, average-achieving students were also included in the program. These students were those who received, next to the targeted students, the lowest scores on the pretest criterion.

Hypotheses

1. Children who are tutored by their parents will make greater achievement gains than comparable students who are not tutored.
2. Participants in the program (teachers, parents, students) will perceive the program to be efficacious.

Overview of the Research Design

The research design used was an experimental pretest-posttest control design. The final selection of 42 students, of which the pretest was the prime determinant, were randomly assigned in matching

groups to either the experimental or control group. The key variables studied were those which might affect the individual participants' response to the program such as:

Students	.absenteeism during the tutoring period .adherence to the tutoring program .perceived efficacy of the program
Parents	.adherence to the tutoring program .understanding of the content and process .perceived efficacy of the program
Teacher	.adherence to the tutoring program .perceived efficacy of the program

The comparison of pretest and posttest results between groups was used to determine the success of the program in terms of achievement. Data from participant questionnaires and recorded information from teacher and parent meetings provided evidence of perceived program efficacy.

Study Limitations

The major limitation of the study is the short time period, four weeks, in which the tutoring intervention was applied. This time period was selected as a reasonable minimum duration in which to expect an impact from the tutoring. In addition, if achievement gains are shown, this study does not provide for long-term follow-up which would give evidence of whether or not these gains are maintained over time. Another limitation is the fact that quality of tutoring interaction was not assessed, nor was the researcher able to determine if parent reports of actual tutoring time were accurate.

Significance

The purpose of this study is to demonstrate whether or not parent tutoring can increase the academic achievement of low-achieving mathematics students. If the hypotheses are supported and are further corroborated by other research, then schools will be provided with a potential model for increasing student academic achievement. Assuming the project's success, teachers will be provided with a model to "initiate and accomplish the programs of parent involvement that help them most" (Becker & Epstein, 1982, p. 88). As well, parents interest in collaborative efforts to support their children's learning will be facilitated by a model which teaches them 'how' to help their children. Lastly, through focusing on the subject of mathematics and intermediate, rather than primary, grades, it is hoped that research in the area of parent tutoring will be extended and that teachers will be encouraged to explore parent involvement beyond the primary grades and the subject of reading.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

Process

A computer search of the ERIC data base of journals and documents from 1975 to the present was utilized to gain a broad spectrum of available literature pertinent to the study. The plan was to gain access to studies which involved, specifically: parent tutoring at home, elementary students, student achievement and, if possible, the subject of mathematics. Three different sets of descriptors were used to gain the appropriate reference literature: Parent Teacher Cooperation and (Mathematics or Tutoring), Tutorial Programs and Parent Participation and Elementary School, and Parent Participation and Achievement and Elementary Education and Mathematics. These descriptors yielded a broad base of research studies from which to select.

The references included all types of parent involvement programs both at school and home, which dealt with children's learning or curriculum. Some of the programs involved parents working directly with their own children on instructional activities at home. However, the majority were characterized by parents working in the classroom as volunteer aides with selected students, or constructing materials at school to use with their own children at home.

Small-scale studies not requiring government or private foundation monies were included, as well as large-scale studies implemented and funded at the district, state, or federal level. Many

of these large-scale programs employed paid coordinators, aides, and teachers on special assignment to the program. They were also directed at specific subjects, such as students in cultural minorities or students whose first language was not English, or students achieving at a level substantially below the desired norms on standardized testing. Small-scale studies tended to focus more on those students in the general student population who were experiencing academic difficulty. They also tended to utilize parents as tutors almost exclusively.

In addition to conducting a computer search, bibliographies which included pertinent references were followed up as sources. One time-consuming factor in conducting the search was the fact that the majority of sources were in microfiche, rather than journal form. This meant extra research time in obtaining pertinent data. It is hoped that the extensive description of microfiche documents contained in this report will assist future researchers in the area.

Rationale for Selection

In selecting articles and reports for this review, certain types of studies were eliminated from consideration. Large-scale studies which dealt with minority groups where English was not spoken in the home environment were not considered. Also, large-scale studies dealing primarily with difficulties caused by cultural or economic deprivation, such as federal native Indian programs, were not included. While worthwhile, these programs did not relate directly to

the focus of this study; namely, parents working with lower-achieving children to increase their academic success. Other groups of studies eliminated were those which did not deal specifically with parents and teachers working on instructional activities with children. In this category were such programs as telephone "hotlines", individualized instruction labs and "make-and-take" sessions.

The studies selected for consideration were those which applied most directly to this study; namely, those which involved an instructional tutoring component above and beyond the regular classroom program. Although the focus is mainly on parents, in both volunteer and paid-aide capacities, three studies were included describing tutoring programs using peer or university tutors. Due to the small number of studies which had incorporated or completed an evaluation of student achievement, studies were included which appeared to be of merit or show potential, even though an evaluation component was unavailable.

Although the original intention was to concentrate on studies at the intermediate level, a lack of sufficient literature at this level necessitated incorporating a broader range of grade levels. Therefore, studies were included describing programs from preschool to the Grade 12 level. It was also necessary to include a broader range of subjects. It should be noted that the majority of small-scale studies involved the subject of reading, while the larger-scale studies often incorporated both reading and mathematics as their focus. A final selection of articles included those which addressed

the subject of parents working with children in general. In other words they addressed the philosophy and practice of parent involvement. A last observation is that the majority of available research was from the United States, with a minority from the United Kingdom. Only one Canadian study emerged from the literature search.

Description of Findings

Philosophy and Practice

Previous to describing specific programs, it seems pertinent to address those studies or reports which deal with the philosophy and practice of parent involvement. Some of these documents were included in comprehensive reports outlining various programs as well. Throughout this literature, several themes became apparent. They are as follows:

1. Parental pressure for more significant involvement in schools is increasing in North America (Fullan, 1982; Johnston & Slotnik, 1985; Moles, 1982).
2. The major thrust for the increased interest in parent involvement programs initiated from the American federal funding programs such as Headstart, Homestart, Follow-Through, and Title I (McKinney, 1975; Moles & Collins, 1981; Williams & Stallworth, 1984).
3. The majority of parent involvement programs are initiated at the early elementary level and in the subject of reading or language arts, but that interest in expanding these programs to include upper elementary and secondary students, as well as the subject of mathematics, is increasing (Collins, Moles & Cross, 1982; Epstein, 1984c; Moles & Collins, 1981).
4. Evaluation of these programs in terms of student achievement has generally not been available due to the failure to separate the various components of parental

involvement and their effects (Collins et al., 1982; Epstein, 1984b; Stallworth & Williams, 1984).

5. Emphasis on programs which involve parents working with their own children at home, as opposed to some parents working with children at school will help 'more' children increase their academic success (Collins et al., 1982; Epstein, 1984b; Rich, 1984).
6. It is a myth that lower-income, socially-disadvantaged, single-parent, or working parents are not interested in working with their children at home (N.E.A. Gallup Poll, 1980; Epstein, 1984b; Rich, 1984).
7. In order to ensure the success of parent involvement programs, teacher training courses on parent involvement at the preservice and inservice level are vital (Collins et al, 1982; Epstein, 1984b; Espinoza, 1984; Sartain, 1974; Williams & Stallworth, 1984).

Of these seven themes, five of the seven are fairly straightforward and substantiated by the studies and reports of the majority of major researchers in the field. However, numbers five and seven bear further discussion. It is important to note that two of the researchers who supported these themes were persons whose research included the relationship between parent involvement practice and teacher/administrator practice and attitudes, rather than just a concentration on the parent/child relationship.

Joyce Epstein (1984c), in her answers to questions posed at the Congress Hearing by the Committee on Children, Youth, and Families, stated that research measuring effects indicates that volunteers and aides working at the school may be important in terms of short-term goals. However, if we are interested in long-term results in improving achievement for all students, then "all parents need to have information from the teachers about how they can monitor and assist

their own child at home with learning activities and homework" (Epstein, 1984c, p. 104). Epstein points out in her prepared statement to this committee (Epstein, 1984b), that over 70% of the parents, in her survey of 1200 parents of 3700 Maryland elementary teachers' students, had never helped in the classroom or in the school. At the same time, over 85% of these parents reported that they spent 15 minutes or more helping their child at home when asked to do so by the teacher. Parents also stated that they could spend more time if they were shown how to help. Epstein states quite unequivocally that, if teachers had to choose between parents working with children at school or working with their own children on learning activities at home, "the most payoff for the parents and students will come from teachers involving parents in helping their children on learning activities at home" (p. 74).

Williams and Stallworth (1984), at the same Congress Hearing, discussed the findings of their Parent Involvement in Education Project. This project is based on the tenet that to improve the quality and effectiveness of public schools, parents and educators must develop more of a collegial or collaborative relationship regarding educational issues and concerns as opposed to an adversarial one. In order to determine the prospects of this potential relationship, teachers and educators were asked to report their opinions regarding various aspects of parent involvement. A written questionnaire was developed and used to gather this information. Six states in the southern United States were used as

subjects for data collection. The states included Arkansas, Mississippi, Louisiana, New Mexico, Oklahoma and Texas. National, state, and local organizations of parents and educators assisted the project with its survey. One of their findings was that both parents and educators were strong in their support of three types of parent involvement, one of these being in the role of home tutor. The role of least interest or importance was that of "Paid School Staff", which would include the role of parent aide. When parents were asked to rate 10 suggestions for getting more parents involved, two of the most highly rated were "sending more parent involvement information home" and "helping parents better understand subjects being taught" (Williams & Stallworth, 1984, p. 119).

Dorothy Rich, President of the Home and School Institute, in her prepared statement submitted to the Congress Hearing (1984), pointed out that many of the current reports on the nation's educational status were school-based; that they did not address actions that need to be taken by the school to work with the home. She reminded her government audience that research is clear on the importance of the family as educator, yet the focus and the responsibility for educational reform "continue almost exclusively on the school" (Rich, 1984, p. 113). Rich announced a new program sponsored by the National Education Association (NEA) and initiated by the Home and School Institute which would pilot a Teacher-Parent Partnership Program in twelve districts to begin in the fall of 1984. The program would directly involve families in an educational role with their children.

The critical importance of training teachers in parent involvement awareness, techniques, and options is explored by Epstein (1984b), Stallworth and Williams (1981), and Williams and Stallworth (1984). Stallworth and Williams (1981) found in a survey of 575 professors of education at colleges and universities with elementary education programs, that teacher training has continued to stress classroom teaching skills and has not yet addressed the new skills which teachers may need to work with parents in the schools. Findings from their survey showed that only 4% of the professors taught a course on "teacher-parent relations". Approximately half of these educators taught one or a few classes in which aspects of parent and community involvement were included.

In the Implications and Recommendations section of their presentation to Congress, Williams and Stallworth (1984) state that "preservice teacher education must focus on providing prospective elementary teacher candidates with an overview of the various models of parent involvement as well as providing them with knowledge about potential costs and benefits to be derived from each model" (p. 120). They also suggest that in-service training for teachers in parent involvement must also begin with a developmental framework to look at the various models; that the training should focus on teachers' attitudes and motivations first, proceed to knowledge and then to actually developing requisite skills. They suggest a series, rather than a single workshop.

Epstein (1984c), in her answers to the Congress Committee, stated that there are few courses that teach teachers how to work with parents on learning activities at home. Epstein and Becker (1982), in their survey of 3700 Maryland teachers, found that about 15% of the teachers attributed the use of their most useful parent involvement activity to a college course, college professor, or reading in education. In contrast, about 40% of the teachers who used any techniques attributed their best parent involvement practice to ideas obtained from their principal, another teacher, a parent, or their own experience as a teacher. In summarizing her presentation at the Congress Hearing, Epstein (1984b) mentions the need for two kinds of efforts: research that identifies the links between practices and effects, and preservice and inservice training for teachers "to know how to implement parent involvement programs and to learn how to help parents help their children to do better in school" (p. 72).

Programs Funded at the Federal/State or District Level

Collins et al., (1982) studied 28 parent partnership programs in 24 large U.S. cities operating during the 1980-81 year. Their report describes school system initiated programs designed to involve parents more fully in the education of their children. Information about the programs was gathered through telephone conversations and through visits to seven program sites. School systems were asked to provide information on programs that might help parents act in educational capacities, such as home tutors, monitors of homework and

attendance, as guides for their children in the use of community educational resources, or engaging in other home activities to improve student learning.

The 28 program profiles include program objectives, major activities, staffing, target populations, funding, evaluations, materials available, and the name of a contact person. The seven in-depth reports resulting from site visits cover each program's objectives, rationale, development, operation, cost and personnel information, supporting and inhibiting factors, evidence of success, and other areas. The study is unusual in that it concentrates on programs from grades 4 to 12, excluding the pre-school and primary levels.

Twenty-four of the 28 programs see academic achievement in reading and mathematics as a major goal and 18 of the programs expect parents to tutor their children at home. Of these programs there was a strong element of local and state support for 15 of the 28 while the remaining 13 relied on federal education funding entirely. Twelve programs noted student achievement gains with 11 reporting greater parent involvement in children's learning and development. However, Collins qualifies these reports of success by saying that The National Institute of Education (NIE), the sponsoring organization, cannot vouch for these claims since the data on which they are based has, in most cases, not been examined.

Collins also notes that many of the studies in this report are quite new and have not been studied in any detail or with great

precision. He attributes this to lack of resources, rather than lack of interest. In terms of future needs, Collins sees a need for evaluation studies to report on the process by which home-school collaboration makes a difference, if it does, in students; namely, contacts with schools where the parents learn what is needed, and, second, parent interaction with their children where the learning activities are carried out. It should be noted that a study by Moles (1981) is a preliminary report based on this same data. A report by Reul (1981) is simply a collection of parent involvement program descriptions by educators from 35 Washington State school and education service districts. There is no summary, recommendations or implications of the research. The program descriptions were compiled as data on school volunteers for Washington's six regional "Partners in Education" programs. Included are 115 ideas for parental involvement from the National School Volunteer Program. One of the topics covered within these reports is tutoring, and it is the results of this strategy which will be addressed.

There were a total of seven programs which offered tutoring as a parent involvement strategy. Of these, three utilized parents as tutors at home and the other four involved in-class tutors, all volunteers. Of the three using parent tutors at home, two of the three reported achievement results, while the other reported that the program was rated highly by the participants. The two reporting achievement results took place in Yakima School District, a district which has a well-established parent involvement program.

Project Home Base, in Yakima, serves 200 preschool children and their parents. Each week parents are visited in their homes by a paraprofessional parent educator who demonstrates a learning task and gives the parents additional information about child development. The parents then teach the task to their child and incorporate the information in their parenting practice. Children participating in this program showed significantly higher academic achievement than non-participants. Their mothers showed significant growth in parenting-teaching skills. One hundred per cent of the mothers taking part in the program in 1978-79 rated it as very beneficial.

Yakima's Follow Through Project, which employs the same procedures as Project Home Base, has as its participants over 900 children in grades K-3 and their parents. These children showed improved self images after taking part in the program. As well, the improved parenting-teaching skills of the participating mothers were significantly related to their children's improved academic achievement. Perhaps even more significantly, in terms of long-term benefits, the younger brothers and sisters of children enrolled in Follow Through showed significantly higher academic achievement than comparable children whose families did not participate in one of Yakima's home-school education projects. It should be noted that these reports did not describe the research design for evaluation, therefore it is difficult to assess from this report whether or not their claims are valid.

Selected reports from the 1984 Congress Hearing on Roles for Parents have already been discussed. There were, however, other reports of interest to this study. One was a federally-funded National School Volunteer Program in Dade County Public School District where a study was conducted in conjunction with the University of Miami in 1975. Volunteers who were trained as tutors worked with students in grades two through six who were one or more years below national norms in mathematics achievement. They tutored three times a week, two hours each time, for a total of a three-year period. The researchers set up control groups, utilized pre and post testing, and the study incorporated the subjects of mathematics and reading. Results measuring mean grade equivalent scores showed that tutored students gained significantly more than non-tutored subjects in both subjects. Another interesting program is that of the Salt Lake City Volunteer Program (Improving American Education, 1984). Their volunteer program began in 1969 and they now count over 17 000 volunteers in the program. Mrs. Berry, President of this organization, stated that one of their main foci is training; both for educators and volunteers. Their training program is both extensive and comprehensive. Although the program does not provide evaluative data on the effects of parent involvement in their children's education, Mrs. Berry stated that the association believes the city's student scores on standardized tests indicate the benefits of this involvement. Achievement levels at grades Kindergarten through eight are over the national norms at every grade level and, in some grade

levels, two years above the national norms. It should be noted that no information was presented which related the amount of volunteer time devoted to student learning activities to the degree of student achievement over a period of years. This would perhaps have provided a stronger indicator of success. A third program (Improving American Education, 1984), which appeared to be outstandingly comprehensive in terms of numbers of volunteers and types of involvement, was the Seminole County School System's Community Relations Program. However, there was neither emphasis on, nor reporting of, data related to student achievement or home tutoring programs.

Programs Without Major Funding

Parents tutoring at home

a) Programs measuring achievement

Three studies in this category measured achievement results and also incorporated a research design utilizing a control group. One was an English study conducted by Tizard, Schofield, and Hewison (1982). A collaboration between teachers and parents was organized so that every child in two randomly chosen top infant classes at two separate schools (schools one and two) was regularly heard reading at home from books sent by the class teacher. The intervention was continued for two years. Comparison was made with two parallel classes at the same schools whose students were not receiving homework assistance. In addition, children at two randomly chosen

classes located at two different schools (schools three and four), again randomly allocated, were given extra reading tuition in school with two classes at these same schools acting as the control group.

The report presents cross-sectional analyses which show a high significant improvement by children who received extra practice at home in comparison with control groups, but no comparable improvement by children who received extra help at school. The gains were made consistently by children of all ability levels. Through utilizing the control group receiving extra practice at school, Tizard et al. gained an indication that it was not just extra time on task that increased performance, but parental assistance that was the important influence. One recommendation of practical note bears mention. Tizard et al. suggest that their findings indicate that "staffing resources at present allocated...for remedial work in primary schools might be better employed, at least in part, in organizing contact and collaboration between class teachers and parents...on specific, practical teaching matters" (Tizard et al., 1982, p. 14).

A second study using a control group which measured achievement results was undertaken by McKinney (1975). The purpose of the study was to teach parents tutoring skills so that they could help raise their children's academic achievement in reading and mathematics. Fifty parents were trained two hours a week for 15 weeks to tutor their children in reading and mathematics at home. A group of children whose parents were not trained in the tutoring sessions were used as the control group. Utilizing a pretest/posttest design,

positive significant differences were found for the experimental group in both subjects.

The third study (Epstein, 1984a) was unusual in that its control group was determined by the degree of teacher use of parent involvement, thereby being the first study to link particular teacher practice concerning parent involvement to achievement change in their students. The study used longitudinal data from 293 third and fifth grade students in Baltimore City who took the California Achievement Test in the Fall and Spring of the 1980-81 school year. The students were in the classrooms of 14 teachers who ranged in their emphasis on parent involvement from confirmed leaders (confirmed by the principal for frequent use of home-learning activities) to infrequent users to confirmed non-leaders or non-users.

Results showed that students whose teachers were leaders in the use of parent involvement made greater gains in reading achievement than did the students of the other teachers. There were no effects on change in mathematics achievement of teacher practices of parent involvement. Epstein suggests that the lack of positive change in the mathematics achievement may be the already documented teacher propensity for using reading activities in parent involvement practices rather than other subject activities (Becker & Epstein, 1982), therefore parents have more know-how in this area than they do in mathematics. She suggests that teachers need to give more attention to helping parents of older children learn how to help their children in mathematics at home.

The next group of studies which measured achievement results did not utilize a control group design, therefore were not able to substantiate their claims to the extent of the previous group. Two were small-scale studies, the subjects being 4 families and their children in one study and 39 in another. The third study employed three samplings, the number of families ranging from 65 to 104. All three studies involved parents working with their children at home and two of the three incorporated a parent training component into the program. The Nicassio study included the subjects of mathematics and reading, as well as a broader range of skills, while the other two concentrated on the subject of reading only.

The first study (Nicassio, 1978) adapted materials from Home Base, the federally-sponsored program in Yakima (see Reul, 1981) and utilized paraprofessional parent educators to facilitate a coordinated and collaborative home and school study program by means of weekly home visits. Both this program and one of the other studies (Morgan & Lyon, 1979) trained the parents to improve the instructional relevance of their interaction with their child during tutoring.

The results of the Nicassio study (1978) were obtained by using Goal Achievement Scaling, a method of determining whether or not a program meets its objectives. Results showed that the Parent Outreach Program (POP) met its criteria for success and surpassed its expectations for all but a single program area. SAT pre and posttest scores (for Fall of 1977 and Spring of 1978) were also stated. However, the author felt that without a comparative control group

against which to measure results, there was no valid way in which these scores could be interpreted. A final note: questionnaire results and anecdotal comments indicated it is likely that the siblings and parents of focal children gained in various ways from program efforts.

The other two studies (Morgan & Lyon, 1979; Hewison & Tizard, 1980) involved the subject of reading. The Morgan and Lyon study used only four children and their mothers in a paired reading technique. The mother and child were trained at school by a remedial teacher to facilitate tutoring at home. Results were measured by comparing previous chronological rate of progress in both reading accuracy and comprehension to the chronological rate of progress over the tutoring period. The group of four children averaged 11.5 months' progress in 6.25 months. Previous to tutoring, the children had averaged less than average progress in reading. The authors recommend this procedure as a simple and flexible remedial technique for general application.

The last study in this category (Hewison & Tizard, 1980) used parent interviews and standardized tests to study the relationship between a number of home background factors and reading ability. The children were aged seven to eight and were from working-class backgrounds. Three samples of 63, 100, and 104 were studied. The home background factor which emerged as most strongly related to reading achievement was whether or not the mother regularly heard the child read (coached). When the amount of coaching the children

received was related to reading test scores, a highly significant positive association was found. A limitation of the study pointed out by the authors is that it leaves unanswered the major question as to why some parents coach and others do not. Therefore, reading success of the children may not have been due to coaching, but to the interest parents took in their child's schooling, of which coaching was merely an indicator.

b) Studies not measuring achievement

One study which, although it did not measure achievement results, seemed important to include because of some of the qualitative data collected. This was a study carried out by Weidman (1985) which was initiated by the School Volunteer Association of Pittsburgh in 1982. The goal was to provide parents with the resources that are necessary for them to reinforce at home the basic curriculum that was being taught to their children in school. The Map-at-Home Program assumes classroom teachers' support, but teachers are not responsible for preparing materials or instructing parents in how to use them effectively. A teacher on special assignment prepared most of the curricular materials and conducted both parent and teacher workshops on their use. By 1984-85, parent enrollment in the program had grown almost 50% to 3030 students and their families. The breakdown in participation showed the following enrollment: K-2 (1621), 3-5 (913), 6-8 (496).

The results showed, through parent questionnaire responses and the increasing interest in the program, that parents were not only

committed to helping their children do better in school but were also willing to be active participants in training activities which improved the quality of their involvement. Parents were enthusiastic about the contribution the Map-at-Home Program made to both their own and their children's learning of mathematics and reading. A notable finding was that in higher grade levels parents reported learning more about mathematics than those using the materials with children in the lower grade levels.

Parents tutoring at school.

a) Studies measuring achievement

A study by Okin (1978) was selected for this review because of its similarity to the present study, even though it involved only kindergarten children and their parents as participants. Similarities were as follows: a comprehensive training program for parent volunteers, training planned and conducted by the students' teachers (the school psychologist, principal, and elementary supervisor contributed to the workshop sessions as well), and utilization of specific objectives derived from the classroom curriculum. The eight students selected for tutoring at the school had been screened and identified as developmentally delayed on the district screening program for entering kindergarten students (DIAL). These performances were confirmed by teacher ratings.

The tutoring took place over five months one or two times per week for approximately 30 minutes per session. There were 16 workshops for parents of 2 hour duration, 9 of which addressed

specific tutoring objectives and the remaining 7 discussed parenting skills and the understanding and management of children. It should be noted that the last 7 were offered as a 'pragmatic lure' to encourage parents to become involved in the program.

Post-screening data indicated that all students improved on at least two-thirds of all skills from which tutoring objectives were established. Most of these same students showed no improvement in weak skills for which tutoring objectives were not established. The teachers viewed only three of the eight students as improved in specific skill areas from September to May. For the other five students, teacher ratings were not commensurate with the students' post screening results. Possible explanations for this discrepancy between test results and teacher assessment were suggested by the author (Okin, 1978).

b) Studies not measuring achievement

An article by Criscuolo (1973), Reading Supervisor of New Haven Public Schools, describes the Community Tutors in Reading program in the New Haven, Connecticut public school system. The goals of the program are two-fold: to provide extra tutoring for inner-city children and to involve "unreachable" parents - parents who have always refused to become involved in school activities but are needed to reinforce reading skills at home. The program was originated in 1970 by 2 parents who recruited 30 parents to work in 11 inner-city schools tutoring intermediate-grade youngsters 8 hours a week.

The tutors receive an intensive training program from members of the New Haven reading department before they actually participate in the tutoring program. After placement in the schools they are directed by each school's reading specialist. Although no achievement or other formal data is available for the program, the author reports that both teachers and administrators are enthusiastic toward it. The author notes that the techniques learned for tutoring sessions are also helpful when the tutors are working with their own children and the children of their neighbours - that they have developed an awareness that the teaching of reading "is a craft" (Criscuolo, 1973, p. 41).

In terms of the program's second goal, reaching 'unreachable' parents, results of several activities suggested that the key to getting parents interested "seems to be making the programs practical and specific, fostering active participation and involvement" (Criscuolo, 1973, p. 41). A final point of interest is that plans for the Fall of 1973 included releasing reading teachers from their other assignments to conduct reading seminars with parents in the recreational centres of various housing projects in the city. A second article describing a parent-tutoring program at the school was discussed by Massey and Myers (1975). This program, as well, was initiated by parents, a group of seven young mothers who offered their services to the superintendent of the El Paso, Texas Independent School District in 1970. They were willing to assist in schools where the need was greatest. Following a consultant's advice,

a decision was made that borderline schools (not the schools of the affluent, nor the poverty-stricken neighborhoods where federal programs were providing assistance) were the schools where the need for assistance was greatest. At the end of the first year, the regular classroom teachers of the children involved reported objective, measurable gains in both reading and mathematical skills. No data, however, were available.

This program within two years expanded into a city-wide Volunteers in Public Schools Program (VIPS) modeled on a program by the same name in the Houston Independent School District. Every elementary school in El Paso, as of the publication of this article, has at least a few classroom assistants and tutors providing regular, consistent assistance to students. These parents receive an on-site training session at the school which is followed by a more definitive training in special-interest groups. The article does not state whether or not a classroom teacher provides the training. A manual is provided to each parent volunteer.

Non-parent tutoring.

a) Programs measuring achievement

A study of particular interest was one by Eisenberg, Fresko and Carmeli (1981) which described cognitive changes in socially disadvantaged children in Grades 5-7 who were participating in a one-to-one tutoring program in Israel. Tutors were university students who received a partial tuition rebate if they met their child twice a week in two-hour sessions over a seven-month period. At

publication time, the Perach Project was in its sixth year and operating within every university in the country; in 1980-81 approximately 5000 student-pupil pairs were formed. The underlying philosophy of the program is that the tutors will help the children progress in school as well as motivate them to take an interest in themselves and their surroundings. The program's organization includes a university coordinator for every 35-50 tutors. The coordinator is responsible to a university manager who is, in turn, responsible to the National Coordinating Office. Although no in-depth training is provided for tutors, they meet collectively with their coordinator once a month for guidance.

In a two-year evaluation study of the Perach Project, the progress of a sample of tutored children was compared to that of a sample of nontutored children in mathematics, reading (Hebrew), and English. The tutored children were not found to be at an advantage on the tests, although other data from tutors, parents, children and teachers indicated that the project should be having an impact on academic achievement. Parents, teachers and tutors tended to give a very high rating to the project, reporting that most of the tutored children were showing more progress in school, participating more in class, doing homework more regularly, and developing more positive attitudes toward school. In addition, Perach students reported that, in comparison to the control groups, they were "more satisfied with their academic performance in school, more often ...participating in

class, and were doing more leisure-time reading" (Eisenberg et al, 1981, p. 314).

Although the authors concede that perhaps no cognitive changes took place, they suggest the following possibilities for this lack of positive result: control students perhaps received help from other school sources or tests did not measure tutoring content (most tutors worked on basic skills rather than on the material taught in class). The authors mention that the project's critics find fault in both the lack of training for tutors and the program's loosely defined goals.

b) Programs not measuring achievement

Both programs selected for this category utilize a peer-tutoring strategy to increase student success. Jenkins and Jenkins (1987) used Levin et al.'s (1984) study to provide research support for this technique. Researchers in this study found that "peer tutoring produced more than twice as much achievement as did computer-assisted instruction, three times more than reducing class size from 35 to 30 students, and close to four times greater achievement than would result from lengthening the school day by one hour" (Jenkins & Jenkins, 1987, p. 65). It is noteworthy that parent tutoring at home was not considered as an option for comparison.

Jenkins and Jenkins describe Lake Washington District's Peer Tutoring Model which has been operational for the past four years. All students selected for the program had failed to achieve satisfactorily with ordinary classroom instruction. In the Elementary Model, remedial and special education resource teachers organize and

supervise the peer tutoring. In the Secondary Model, tutoring classes are part of the regularly scheduled course offerings. Initial training for tutors in this program lasts approximately two weeks and additional training is scheduled periodically.

The authors mention the importance of classroom teachers defining objectives in terms of their classroom curriculum and the need for systematic training in order to sustain an effective tutoring program. Although no achievement results are available, the principal at Lake Washington High School reports that "this program has contributed more to helping students succeed and in creating a caring environment than any intervention we've tried in my six years at this school" (Jenkins & Jenkins, 1987, p. 68).

Another article describes the Canadian Outreach Program (Outreach Tutoring, 1973) in Halifax, Nova Scotia. Its aims are to provide voluntary tutoring to those children in Halifax who need it and to help begin new projects that will hopefully become self-sufficient in time. This program fundamentally utilizes a university student tutoring model, although it has included involvement in various other types of tutoring projects as well. The university model, at publication, had been in operation since 1970 and grew in 1972-73 to include 100 tutors. Its expansion necessitated the use of four student coordinators and the program was able to contact nine schools to offer its services.

Training was provided and a resource kit was prepared by the staff for each tutor. The actual tutoring entailed the tutors

spending an evening each week at the child's home to assist his understanding of school subjects. The three participating universities offered funding in terms of coordinators, office space and furniture. No research data supported this article although the author mentioned that the Maritime School of Social Work had initiated a research study into OutReach's methods and consequences.

Other tutoring programs in which Outreach participated included a partnership between two schools, coordinated by a remedial reading teacher and a vice-principal. The tutors met twice a week, working at the community center, the school, or the child's home. Tutors were trained at the mobile reading unit of the Dept. of Education. Another program of interest was a partnership between a Drop-In Center and the neighboring school. A number of tutors were available in the school one night a week to give help to students who needed it.

Interpretation of the Findings

The task of interpreting these findings is complicated by the breadth of variety in program type and the unevenness of available or reported data. The programs can be divided broadly into funded or non-funded. Within each of these umbrellas, specific tutoring categories can be further delineated. Under funded programs, there exist paid and unpaid parent/community tutors at school, and paid staff working with and training parents at home. Under unfunded programs, there exist volunteer parent, community, and student tutors at school, and parent and university tutors working with children at

home. To further complicate the task at hand, studies were discussed which evaluated the practice and philosophy of parent involvement - studies which, through embracing a more general focus, encompassed both the other two categories.

Nevertheless, it is possible to draw together this broad range of programs and studies to reveal some similar characteristics or themes:

1. One-to-one tutoring is a proven and potential vehicle for increasing student success.
2. Interest in this strategy is increasing on the part of parents, teachers, administrators, and researchers.
3. In terms of long-term results, including the potential benefits to siblings of tutored children, parent tutoring at home is the most viable tutoring strategy for improving student achievement.
4. Co-ordinators appear to be a consistent factor in successful tutoring programs and, where funding was not available, more than one researcher suggested the efficacy of using the services of a remedial reading or learning assistance teacher for this purpose.
5. Training for parents, and sometimes teachers, is a consistent factor in successful tutoring programs.
6. Historically, most programs take place at the early childhood or primary level and in the subject of reading, but interest in intermediate grade programs and the subject of mathematics is increasing.
7. Historically, the majority of programs have been based on the improvement of basic skills, as opposed to programs based on classroom curriculum content. However, more recent studies are beginning to emphasize content directly related to classroom curriculum.

In summary, three major factors emerging from this review should determine future direction in parent involvement relating to student academic success. The first is that parents helping their own child

at home is the most viable long-term tutoring solution for improving the academic achievement of all children. Secondly, parents want to know how to help their children and are willing to participate in training programs which will give them this knowledge. And thirdly, the majority of teachers and administrators are not skilled in utilizing parents to support school efforts in increasing student achievement. There is little available training which can provide them with the skills to initiate and implement this type of involvement.

If we accept the first two factors as a basic premise, then the third, the paucity of training for teachers and administrators in parent academic involvement, is a critical topic for teacher pre-service and in-service training. Indeed, Williams and Stallworth (1984) attribute the lack of a more clear perception among parents and educators regarding the meaning and importance of parent involvement to stem from neither group receiving systematic training with respect to its purpose, principles, and benefits. It seems vital that, if educators are to fully utilize the potency and impact of parental involvement in academic endeavors, then universities and district professional development departments need to incorporate a comprehensive training component into their existing programs. In addition, as Williams and Stallworth (1984) point out, districts need to establish staff and financial resources to facilitate this involvement and develop policies that set frameworks for such models.

Research implications of this review can be summarized quite succinctly. There appears to be a high degree of congruency between researchers in their recommendations for future research. A need was expressed for longitudinal studies which research the effects of these programs on students, namely in terms of achievement. These studies should investigate the quality or type of training component for parents at school and the parental interaction with their children at home in relation to this achievement. A need was expressed, as well, for more studies which look at intermediate and secondary parent involvement relating to achievement and the content area of mathematics.

CHAPTER THREE: METHODOLOGY

Program Description

This study is a description and evaluation of a parent tutoring program for elementary students in the subject of mathematics. It took place between January and March of 1987 with the actual tutoring occurring during the month of February. During evening workshops, parents were trained by classroom teachers to tutor their children on specific concepts taught concurrently in the classrooms. The study encompassed students in grades four and six.

One of the teachers, the researcher, took the responsibility for coordinating the program. This role involved recruiting parents and students, planning and chairing meetings, arranging workshop schedules, and collecting student achievement data for program evaluation. The role of teachers included providing student data (including testing results) for selection and evaluation, attending an introductory and evaluation meeting, and presenting two curriculum workshops for parents. Parents were required to attend two meetings, two workshops, and to tutor their children at home for a period of four weeks. Students agreed to participate in the home tutoring sessions.

The goal of the program was to provide additional, effective instructional time for low and low-average achieving mathematics students at critical times in their learning; namely, at the introduction of new, major concepts into their classroom mathematics programs. The concepts which provided the foci for the tutoring were

determined by the classroom teacher according to her individual program. The grade four teachers chose the topic of multiplying one and two digit factors; the grade six teachers selected working with decimals. The objectives were as follows:

1. Parents and students will understand the rationale for the program.
2. Teachers will provide parents with a model and teaching strategies for home tutoring.
3. Parents will be able to use the model and strategies to tutor their children at home.
4. Students will receive additional effective instruction relevant to their classroom program.
5. All participants will contribute to a program assessment.

Sample Selection

The school setting for the study was a suburban, lower-middle class neighborhood. The school is located in the second largest school district in the province. Although the district offers remedial assistance to lower-achieving reading students, there is no provision for students requiring mathematics remediation. Standardized testing is not a priority within the district; standardized reading tests are undertaken at the discretion of the individual teacher or school, while standardized mathematics testing is almost nonexistent. The four teachers (two of whom shared a teaching assignment) who participated in this study were teachers who felt their classes contained students who might benefit from a mathematics tutoring program and who were also willing to put forth

the extra time inherent in a research project. All were teachers who believed in the value of parent involvement in their child's learning. All had taught for seven years or more.

Students from three classes were selected according to three guidelines: district screening tests or provincial mathematics achievement scores (BCMAT), pretest scores on teacher-developed tests (based on the concepts to be covered during the tutoring period), and teacher-assessment of the students' classroom performance. The pretest scores were used as the main basis for selection, while the other two scores were utilized to provide reinforcement for selection. Through utilizing the three scores, rather than just the pretest score, the researcher hoped to avoid targeting high-achievers who had uncharacteristically obtained a low pretest score. Two students whose pretest scores qualified them for inclusion in the program were eliminated as a result of contradictory data from the other two sources. In order to obtain sufficient students for study, it became necessary to include some average-achieving students, even though the original intention was to select only lower-achieving students.

The original selection based on these data yielded a total of 44 potential students. The grade breakdown was as follows: grade four (two classes) - 28 students (16 in one and 12 in the other) and grade six (one class) - 16 students. Twenty-one of these were students rated by their teachers as being average in mathematics ability while twenty-three were rated as low. These students were then randomly assigned in matching groups to either the experimental or the control

group. Parents of students selected for the experimental (tutoring) group were sent an introductory letter (Appendix A) containing a brief description and rationale for the program and an invitation to attend an introductory meeting the following week.

At this point one parent, whose child was in the grade six group, sent back a reply stating that she did not wish her child to participate in the program. The parent felt that the time demand was too great for her working schedule. For this student, no substitution was made. Subsequently, one student from the matching group in the control students, randomly selected, was eliminated from the study. One parent at the last minute decided not to participate in the program, citing lack of time as her reason. In this case, the student was assigned to the control group and a student in a matching group (randomly selected) was switched to the experimental group. The final total of students for the study, therefore, consisted of 21 in the experimental group and 21 in the control group. At the conclusion of the program, two of the grade six students from the experimental group informed their teachers that they had not received any parent tutoring. Information on these students was dropped from the data, bringing the experimental group down to a total of 19 students. (See Tables 1 and 2 for breakdown of students by class and ability.)

TABLE 1

Breakdown of Students by Class and Grade

n = 40.

	<u>Experimental</u>	<u>Control</u>
Grade 4 ¹	6	6
Grade 4 ²	8	8
Grade 6	<u>5</u>	<u>7</u>
TOTAL	19	21

TABLE 2

Breakdown of Students by Teacher-Rated Ability

n = 40

	<u>Low</u>	<u>Average</u>
Grade 4 ¹	4	8
Grade 4 ₂	11	5
Grade 6	<u>7</u>	<u>5</u>
TOTAL	22	18

Procedures

A meeting of intermediate teachers was held on January 6, 1987, to determine if a group of teachers would be interested in implementing a tutoring program in the school. Previous to the

meeting, all intermediate teachers had been given a copy of the proposal outlining the program's rationale and providing a program description. Of these seven teachers (two of whom share a teaching assignment), one was not interested in a parent involvement program and two did not feel that their classes contained enough students who would benefit from the program. Four teachers indicated a strong interest in participating. Two of the teachers taught grade four, one of these classes being a split grade four/five class. The other two teachers shared a grade six class. At this time, the principal of the school gave her full approval and support to the program.

The first meeting of participating teachers was held on January 7, 1987. At this meeting, timelines were presented, and a weekly meeting date for teachers was decided upon. Weekly meetings, lasting from 15 minutes to one and a half hours were held throughout the program in order to maximize communication and coordination between the participating teachers. At this initial meeting, teachers were asked to decide their area of concentration for the four-week tutoring period and to prepare a pretest based on the test format contained in *Mastering Computational Skills* (Hamada, 1984). Copies of these pretests were submitted to the writer, who was co-ordinator of the program and a participating teacher.

Selection of students for the tutoring program was the next step. The pretest was given to all students on Monday, January 12, before recess. Teachers were asked to submit these scores, along with September district or provincial test scores, and their own assesment

of their students' classroom performance in mathematics rated as high, average, or low. Pretest scores were ranked for each class by the coordinator. September scores or teacher assessment ratings which contradicted this information were circled. Students whose scores or teacher assessments were circled were then further discussed with their teacher to decide whether or not their pretest score was felt to be an atypical performance score. Each teacher then met with the coordinator and a university advisor to make the final selection.

On January 19, the introductory letter was sent home to the parents of the students selected for the program (see Appendix A). It was signed by the school principal as well as the coordinator as it was felt that parental interest might be positively influenced by principal support. Parents were asked to indicate on a return form whether or not they would be attending the introductory meeting. The majority of forms returned were positive. The few not returned, or returned with a negative response, were followed up by a phone call from the classroom teacher.

The introductory meeting for parents was held on January 26. The principal welcomed the parents and introduced the coordinator and participating teachers. The coordinator conducted the balance of the meeting. The theme of the meeting was 'Parents Can Make a Difference'. Parents were given a brief rationale for the program, an outline of the expected commitment for themselves and their children, and a description of the program. A one-page handout was distributed to each parent (see Appendix B). Parents were then asked for a

written commitment attesting to their decision to participate in the program. All parents (18 families were represented) gave their commitment to the program at the conclusion of the meeting. Three parents who were unable to attend the meeting gave their commitment within the week. Two of these parents were parents of the two students who did not receive tutoring and were subsequently dropped from the experimental group.

Following the parent introductory meeting, the teachers met to plan the first parent workshop. Although each teacher would be conducting an individual workshop for their students' parents on the same night, all felt that it was important for the workshop format to be consistent within the group. The following agreements were reached:

1. That there should be direction for parents regarding positive techniques for encouraging their children during the tutoring sessions.
2. That a discussion of these techniques should introduce the first workshop session.
3. A written guide with example questions and when applicable, materials, should be distributed to parents at each workshop session. The packet for the first workshop should contain the positive techniques for encouragement.
4. Each workshop presentation should include practice time for parents of the concept presented. This would include modelling of the tutoring process through partner teaching.
5. The value of intrinsic, rather than extrinsic rewards should be emphasised by the parents with their children.
6. That quality, not quantity, should be stressed in the tutoring sessions.

7. That if parents had any concerns or questions, they were welcome to phone teachers for advice.
8. That parents should adhere to suggested tutoring times (30 min. 3 x a week) as a maximum for the tutoring sessions.
9. That teachers would send home a note if the time frame changed (if they were behind or ahead of their teaching schedule).
10. That it was important to help parents feel comfortable and confident about their ability to understand the concepts, therefore be sensitive to their individual learning rates and capabilities.

At the planning session for the final workshop teachers agreed to follow the general format utilized in the first workshop.

The first parent workshop was held on February 2, 1987 from 7-8 o'clock. Teacher observations and comments on the workshop were tape-recorded at the conclusion of the meeting (see Chapter Four). At the teacher planning meeting for the second parent workshop, a decision was made to begin the workshop with a discussion of parents' perceived program concerns and strengths at this mid-way point in the program. These parental comments were communicated by the respective teachers at the tape-recorded discussion following the workshop (see Chapter Four). Also recorded were teacher reactions to the workshop and their comments regarding the classroom performance of the tutored students. The second parent workshop was held on February 16. At this time, parents were given a time sheet (see Appendix C) on which to log tutoring sessions. They were asked to bring this form to the final evaluation meeting. The time sheet should have been distributed

at the first workshop but the need for this information had not been realized at that time.

On February 25, a letter (see Appendix D) was sent home to parents requesting an evaluation of the program. Evaluation forms (see Appendix E) were coded to protect the anonymity of the participants. Parents were asked to return the form in a sealed envelope directly to the office by February 27. Students were given an evaluation form (see Appendix F) to complete at school on February 27. Their evaluations were also coded and placed in sealed envelopes by the students to preserve anonymity. Teachers were given an evaluation form (see Appendix G) to return by the same date. Students were also given a posttest during the morning of this day. It should be noted that all students in each class were given the posttest to avoid identifying students who were involved in the program.

The final evaluation meeting was held on March 2, 1987 from 7-8 o'clock. The coordinator conducted the meeting. The parents were complimented for their enthusiasm and consistency, teachers were thanked, and results of the questionnaires and testing were presented. The last part of the meeting was reserved for parent and teacher input regarding the program. A lengthy discussion ensued (see Chapter Four).

Data Collection

Both quantitative and qualitative data were collected for this study. Quantitative data were collected to determine whether or not

the children who received parent tutoring would make greater achievement gains than comparable children who were not tutored and to determine whether or not the participants in the tutoring program (students, parents, and teachers) considered the program to be efficacious. Qualitative data were used to gain insight into the participants' perception of the process. Data were collected through test scores, evaluation questionnaires, tutoring time surveys, written comments from teachers, written records of parent meetings and tape-recorded records of teacher debriefing sessions at the conclusion of workshops.

Quantitative Data

These data were in four forms: student absence records during the tutoring period, parent records of tutoring time, pretest and posttest scores, and the evaluation questionnaires.

Student absence. Student absence records during the tutoring period were collected for both the experimental and the control group. The purpose of collecting these data was to ensure that the study controlled for this variable. Absence records for the students were maintained by the teachers and forwarded to the coordinator at the conclusion of the program.

Parent tutoring record. There were two parts to the parent tutoring record. The first part was to determine the frequency with which the parent normally assisted their child previous to the tutoring program. Categories for selection were 'frequently',

'occasionally', or 'rarely'. This information was to be used to provide a comparison between the parents' normal patterns of assisting their children with schoolwork and their patterns during the tutoring period. Although this information was not directly pertinent to the achievement hypothesis of the study, it was thought that it might be of interest in terms of parents' general practice regarding this type of involvement. The second part of the form requested parents to state the frequency and length of tutoring sessions with their children during the actual program. They were asked to supply this information separately for each week. It should be noted that, even though parents were advised to follow the tutoring guidelines of 3 times a week for a maximum of 30 minutes, this form was to provide a check on whether or not they had adhered to the suggested guidelines. Parents were given this form during the second workshop, to be completed at the end of the program, and returned to the school during the evaluation meeting.

Two problems with the form should be mentioned. The first was the fact that, in the parental responses related to length of time per week of the tutoring sessions, it was often difficult to determine whether or not they had stated the total tutoring time for the week or had given a time representing one tutoring session. Wherever there was any doubt, clarification was sought by phone. If used again, this form should make that distinction clear for respondents. The second problem with the form was that it provided subjective, not objective

data. There was no way to determine whether or not the information was accurate.

Pretests and posttests (see Appendices H-K). The third, and most critical, form of quantitative data was the actual pretests and posttests. Although many standardized tests were investigated in an attempt to find one suitable to the program, none was found. The difficulty was that the program was of short duration (one month) and required individual tests which were extensive in one specific area. For example, the grade four tutoring program focussed generally on the strand of multiplication; broken down specifically, to a focus on multiplication by one and two digit factors only. In all the investigated standardized tests, there were only a few questions relating to this concept, not enough to provide a substantial base for differentiation between achievement results.

Therefore, a decision was made to develop teacher-made tests based on the pretest and posttest format contained within Mastering Computational Skills (Hamada, 1984). This was a workbook-type mathematics program developed for remedial and home use. The program consisted of a workbook for each grade level from grade 4 to 6 inclusive. Each workbook was divided into major concept areas for the relevant grade, and further into specific, sequential, steps within the concept areas. Each section had specific objectives relating to the breakdown of the concept areas. At the beginning and end of each section was a pretest and posttest. Although these tests, for both grade four and six, were again not extensive enough in a specific

area, they came closer to meeting the criteria than did the standardized tests. The tests were teacher-marked and then submitted to the coordinator for compilation of data.

Evaluation questionnaires. The qualitative data consisted of evaluative questionnaires distributed and collected from all participants and of anecdotal information collected from parents and teachers. The main purpose of the evaluation questionnaires was to determine whether or not the participants considered the program to be efficacious. All questions utilized a yes/no format. The questionnaires, with the exception of the teachers' form, were coded to achieve anonymity. Teachers expressed a preference for submitting their information uncoded. The questionnaires were prepared with the assistance of an experienced university researcher. The initial idea was that the questions should be comparable from one participant group to another, gaining the advantage of comparing responses between groups. However, upon further consideration, it was realized that, in some areas, a perspective on different aspects of the program was desirable. Therefore, although many of the questions are comparable, some are not.

The questionnaires were distributed, with the exception of the student questionnaires, on Wednesday, Feb. 25. The parent questionnaires were returned directly to the office in a sealed envelope, while the teacher questionnaires were given (at teacher request) directly to the coordinator. The students were given the

questionnaires at school on Feb. 27, which were placed in a blank sealed envelope and sent directly to the office.

The student questionnaire comprised seven questions. One question related to whether or not the child felt the tutoring had assisted his/her understanding of mathematics in class, two dealt with the possibility of improved self-concept, two others addressed whether or not the child felt his parent more able to assist him/her as a result of the parent workshops, and the last two asked the child to state whether or not he/she enjoyed working with his/her parent and would like to participate in such a program again.

The parent questionnaire was divided into two sections; one to assess perceived value of the program itself and the other to determine perceived value of the workshops. There were six questions in the section on program value and seven on workshop value. In the first section, two of the questions addressed whether or not the parents felt more able and more inclined to help their child with mathematics as a result of the tutoring program. Three of the questions attempted to gain the parents' perceptions of whether or not their child's self-concept, enthusiasm, and understanding had improved. The last question in this section, asking the parent whether or not they would participate in such a program again, was an attempt to determine their overall judgement of the program.

The second section was directed at gaining parents' perception of the value of the workshops. Two questions were directed at materials sent home, one at clarity of teacher direction, three at

teacher responsiveness to parent needs and comfort level, and another to whether or not the workshops prepared the parent to help their child.

The teacher questionnaire was divided into two sections as well. The first was an attempt to gain teacher perception of the parents' understanding of the subject content and the tutoring process during the workshops. The first section contained three questions, one directed at the subject content, another at the tutoring process, and the third whether or not the parents accepted the tutoring role as outlined. The second section consisted of 10 questions. Four of these addressed tutored students' performance in the classroom, one was directed at tutored students' self-concept during the tutoring period, two asked whether or not the collegiality inherent in the planning and discussion of the program promoted more consistency of approach between teachers or stimulated individual teacher growth. Two others asked whether or not group parent training had decreased the amount of individual time usually needed for the tutored students, or had increased teacher understanding of parent concerns. The last, as in the parent questionnaire, asked teachers whether or not they would participate again in a similar program.

Qualitative Data

The anecdotal data were collected in both written and tape-recorded form. The bulk of the parent data was collected during the introductory and evaluation meetings. During each meeting, a

participating teacher was asked to record as many parent comments and questions as possible. If a discussion ensued, they were asked to record at least the main elements of the discussion. Although teachers were instructed to ask one parent at each workshop to record parent comments and questions, in all cases, teachers found this to be unsuccessful, with very little information recorded. In addition to the feedback collected at meetings, teachers passed on to the coordinator any notes written by parents during the tutoring period. A few parents, as well, wrote notes on the tutoring time sheets. Teacher input was gathered mainly during tape-recorded debriefing sessions held after each workshop session. The first of these sessions lasted for approximately one and a half hours, the second approximately $3/4$ of an hour. The tape recorder was not used during the parent sessions as it was felt by teachers that it might inhibit parent response. The teachers indicated that they were quite comfortable with the use of a tape recorder during their group sessions. Teachers were also asked to jot down during the tutoring period any observations or information relevant to tutored students, including contact with parent tutors. They submitted this information to the coordinator at the conclusion of the program.

CHAPTER FOUR: RESEARCH FINDINGS FROM QUALITATIVE DATA

This qualitative data analysis comprises all the general non-statistical data collected during the research study. The chapter includes anecdotal information recorded in writing at parent meetings, teachers' written notes, and tape-recorded teacher debriefing sessions. In analyzing this data, the author looked for patterns between and within participant groups.

Parent Meetings

Several areas of parental interest emerged during these discussions. They fell naturally into three categories: positive comments, questions and concerns, and suggestions for change. Although it might be expected that there would be negative comments expressed, there was only one instance in which this occurred and it was phrased in the form of a question.

There were many comments made to the principal at the beginning and end of the introductory meeting expressing parental pleasure at being included in the program and the need they saw for such a program. A triad of student, parent, and teacher working together appealed to parents. At the evaluation meeting there was strong support for the workshops having provided parental clarification of the teachers' programs and approaches; that the workshops, in fact, helped to dispel their children's confusion in being caught between conflicting approaches, that of the parent and the teacher. In answer

to a direct question, "Did you feel it was beneficial for you in helping your child to become acquainted with the teacher's method through the workshops", 18 out of the 20 parents present responded in the affirmative. One parent mentioned, specifically, that the workshops gave her the confidence to work with her child. A couple of parents mentioned, as well, that the emphasis on positive reinforcement had helped them to correct their children's misunderstandings more successfully.

There were several comments attesting to an increase in the children's motivation to work with their parents during the program, in contrast to previous motivation. One parent mentioned sibling interest in becoming involved in the process. She took advantage of this interest, including her younger child in the tutoring sessions. There was also mention of children being more relaxed and confident than before.

There were three concerns expressed by the parents. One was a frustration with their children not knowing mathematics facts and concern as to how they should deal with this. Since factual recall remediation was not the focus of the tutoring program, they were advised to provide their children with the facts, if necessary, or to utilize a calculator - not to get bogged down in non-concept learning. Another common concern was the time suggestion for the tutoring sessions. Parents wondered whether or not they should persist with the tutoring and adhere to the suggested time if their child was not in a receptive frame of mind. They were advised to end such a session

without repercussion and to re-schedule the session for another evening. Parents also wondered whether or not the teachers would be explaining the program to the students and outlining their involvement. This suggestion was followed up by the teachers.

There were two suggestions relating to the future of the program. Some parents felt it would be desirable to open up the program and make it accessible to all interested parents and students. The majority of the parents expressed an interest in continuing involvement with such a program and many were anxious to have another session during the next term. They stated that, if this was not possible, they would be highly interested in receiving a packet such as they received at the workshops, outlining a new unit of study with its related strategies.

Teacher Debriefing Sessions and Written Notes

The tape-recorded sessions with teachers after the workshop presentations were conducted in an informal manner. The co-ordinator began by soliciting general teacher reaction to the process and often let the discussion follow its natural course. At certain times, specific questions were asked to gain desired information or to redirect the discussion. At all times, responses to the various issues were solicited from each participating teacher. In spite of the informal format of the sessions, the information can be categorized into eleven subheadings for analysis. Written notes

submitted to the coordinator by the teachers were incorporated into these categories as well.

Teacher Report of General Parental Reactions to Program

All teachers were of the opinion that, in general, their parents were very receptive and enthusiastic during the training workshops. Teachers spoke of them as being "positive, really involved, and working hard." They also said that there was "lots of talk." Many of the parents mentioned to teachers the advantage they had gained in understanding what their child was doing in class - the 'why' as well as the 'what'. One parent mentioned that he didn't have this advantage (of his own parents' understanding) and hence "got bogged down and fell back." All of the teachers were pleasantly surprised with the high level of parent enthusiasm.

Workshop Presentation/Format

Each teacher felt that there had been an advantage in keeping the workshop group small. This gave them an opportunity to develop a close rapport with the parents and to establish a solid level of comfort between themselves and parents and also amongst the parents themselves. In general, the teachers thought that they had successfully utilized a variety of media and materials, such as the overhead projector, blackboard, concrete materials, and pictorial representations. The two grade four teachers noted a limited opportunity for using concrete materials due to the restrictive

timeframe. Although a decision had been reached during the planning sessions to utilize a partner teaching strategy to teach tutoring skills, none of the teachers was able to do this and still cover all the material required for a two-week tutoring period. In fact, all of them mentioned that it was difficult to cover the necessary material within the hour. In spite of the fact that partner teaching was not used, the teachers did have parents do actual sample questions that their children would be working on during the tutoring period. Although it was agreed upon beforehand to have parents do questions individually, either with manipulatives or with paper and pencil, and to monitor them on an individual or partner basis, the two grade four teachers forsook this for an oral group response approach. They instinctively felt at the workshop that this would save embarrassment and would be less awkward for parents. The grade six teachers felt their individual approach was possible due to the relaxed group. One teacher expressed a concern, which gained support from the other teachers, that she might not be teaching the 'most' effective strategy for student learning of a particular concept. A discussion ensued which balanced the advantages of presenting to parents a strategy which was not yet satisfactory to the teacher, against the disadvantage of postponing a tutoring program until said teacher had developed the 'perfect' learning strategy. Teachers concluded that that it was better to go with what you had, than wait for the ideal.

Parent Learning

All teachers were concerned as to whether or not the parents would perceive the workshops to be a learning experience. They felt that some of the material, or at worst all of the material, would be knowledge that the parents already possessed. However, this did not turn out to be the case. Parents valued learning the new concept-oriented approaches to familiar content. In fact, in most cases, it was the strategies which have been developed to promote understanding and relevance, rather than the rote formulas parents were familiar with, that provided the learning experience.

As well, teachers noticed a range of ability in parental facility for assimilating the information. This observation reinforced their feeling that checking for parental understanding was necessary in order to meet parents' needs. Only one parent was observed to have continued difficulty in understanding the concepts presented within the group and time framework. The teacher felt that further individual time with this parent would have been desirable. Two parents whose children were dropped from the statistical analysis because they did not participate in tutoring at home were also noted to experience difficulty in understanding the concepts. Due to their unwillingness to come to the group workshops because of other commitments, these parents were given a separate workshop at a different time. The teacher later observed that they might have felt uncomfortable or threatened in the group setting due to their difficulty in understanding the concepts. Teachers also noticed that,

within each group, there was some parental anxiety regarding their individual performance in comparison to the group. A conscious effort was made to diffuse this concern and make each parent feel comfortable.

Tutoring Materials

In planning for the workshops, the teachers felt it was important to stress to the parents that they would be playing a supporting, rather than a teaching role - that all material utilized in the tutoring sessions would be previously covered within the classroom program. As well, teachers were concerned as to how much guidance the parents would need in terms of materials for home tutoring. Although the teachers differed in the degree of specificity they felt the parents would require, all agreed that each parent should have some sort of prepared packet of materials to take home with them.

The grade six teachers provided very specific packets, including individual lessons and worksheets or other materials for each tutoring session. Their rationale was that, if they did not do so, the parents might forget what to do. Both grade four teachers provided packets with stated foci for each session, sample questions and materials, but did not provide daily lesson plans. Their rationale was that they did not want to pressure students and parents into following a guideline that might not meet individual needs. They also stated that their overall goal was to provide transfer of learning (tutoring skills) so that parents would feel comfortable creating their own tutoring

content from classroom curriculum when the formal program was over. Parental response to the packets in all classes was positive. The parents reported that the packets were well utilized and that they appreciated the guidance the packets offered. When queried as to the suitability of the specificity utilized for the packets, the grade six parents reported that they found the worksheets and precise lesson plans helpful. Interestingly, the grade four parents also reported that they were satisfied with the guidance provided and did not desire further specificity.

At-Home Tutoring Sessions

During the discussion time which introduced the second workshop, parents were asked to comment on the degree of success they were experiencing with the tutoring and also to voice concerns or problems they were encountering. The majority of parents found the tutoring sessions with their children to be productive and, in many cases, an enjoyable experience for both child and adult. Many expressed the view that they valued the experience as a way of being closer to their children. Parents generally agreed as well, that the workshops gave them "clout" in working with their child. They felt their children were less inclined to pit parent against teacher because they knew that parents were getting the information directly from the source. As one parent put it, "I don't have to argue with her/him about whether or not I'm right or the teacher's right." A few parents mentioned that their children were keener working at home with parent

support than they were before, without parent support - that they procrastinated less. They also stated that the children got less frustrated because parents were able to give them immediate, relevant assistance. One parent in the grade six class mentioned that her child was "normally very tentative toward math, but with this tutoring, went ahead and did a page ahead in the text that she hadn't even started yet because she could see how to do it. She had never been like that before."

While most of the parent comments to teachers were positive, there was one parent who experienced difficulty in working with her grade four child during the tutoring sessions. This parent also expressed a somewhat negative attitude toward the actual program and may have influenced her child's degree of cooperation.

Parents were also asked to comment on the level of difficulty of the tutoring material - whether or not it seemed comfortable for the child. While the majority of parents found the material to be suitable, one parent found the material to be too easy for her child. This student was an average pupil, rather than low, in one of the intermediate grades.

Tutoring/Class Pace Scheduling

In the debriefing session following the first workshop, teachers voiced a concern as to whether or not they would be able to keep the class paced to the tutoring outline given to parents. This was critical as the premise of the program was that material would be

introduced first in class, to be followed by tutoring at home. The teachers reached an agreement that they would try to keep pace, but would be flexible if the tutoring schedule proved not to complement the learning pace within the classroom. They also agreed that if they were not able to keep to the tutoring schedule, they would notify parents through a written communication. Contrary to their initial belief that they would be too slow, all teachers felt during the program that they were forced to restrain their pace a bit in the classroom. If this had been an isolated occurrence with only one teacher, the assumption might have been that the teacher had miscalculated her class' rate of learning. However, since this happened within each class, the teachers explored possible reasons for the occurrence. They felt that, although it was possible they had miscalculated, it appeared that the advantage of the tutoring (namely, less time required for remediation and reinforcement) had allowed them to move at a quicker pace. In general, teachers felt that the compatibility of the tutoring/class pace had been fairly successful. However, in planning future tutoring programs, they would take into account a probable increase in the overall class learning rate as a result of the tutoring.

Selection of Students

As the tutoring program progressed, teachers expressed a concern that the selection of students had not always yielded the students for whom the program would be of most benefit. This was partly a

frustration due to having to select a control group, as well as an experimental group, from such a small sampling. It was upsetting to teachers that some very low students in the control group, if given the benefit of tutoring, might have made stronger gains than some of the comparatively higher students in the experimental group. In addition, as experienced teachers, they had a high level of confidence in their ability to perceive their students' academic abilities and needs. Although the teachers understood the rationale for giving the objective data more weight in the selection process, they were of the opinion that their perception of student performance potential was more valid than that indicated by the pretest, or objective data. One of the drawbacks of the pretest, they felt, was that previous exposure to a concept would influence a student's score, thereby the pretest would not provide an accurate picture of potential student achievement. More than one of the teachers voiced a preference for introducing a topic and then selecting students who were experiencing difficulty. This feeling emanated from their awareness that students might do well in one area of mathematics, but not in another.

Students' Class Performance

Teachers were very positive about the tutored students' class performance. They noted a general increase in participation and enthusiasm during the mathematics period. In specific cases, the change was quite marked. The students were more willing to volunteer answers and, in general, more vocal. Many appeared to be more

confident and positive toward mathematics. The students were prepared during review of previous concepts, therefore ready to move on to the following lesson. Teachers found that these children caught onto the concepts more quickly than they usually did and, therefore, required less individual reinforcement in class. One teacher noted that they finished their work faster and with fewer errors. In a grade four class, the teacher kept track of the order in which the children completed tests and recorded that the tutored children finished their tests more quickly than the control children. Another teacher noted that tutored children who had missed consecutive days of school due to illness did not fall behind as they normally would have done. The teachers had not expected these classroom gains in attitude and participation to be as sudden and as striking as they were.

Teacher/Parent Communication

Teachers discussed teacher/parent communication in terms of other methods more commonly utilized within the school setting, such as conferencing and parent nights. They felt that the tutoring workshops provided more opportunity for two-way communication, focussing on the child's success in school. They attributed this to the advantage of the small group interaction over a period of time. Both parents and teachers had the opportunity to get to know each other, which appeared to result in more honesty about successes and failures in working with the children. They were able to ask questions of each other and to clarify and discuss strategies. Through focussing on a particular

subject, a more in-depth sharing of information and knowledge was possible. As one teacher said, "Just think, normally we spend 30-45 minutes during Parent Night explaining our whole year's program, while tonight we devoted one hour to only two weeks of our Mathematics program!" Teachers also mentioned that they expected the general strategies which were discussed, such as positive techniques for tutoring, would transfer over the curriculum as parents helped their children in other subjects.

Teacher Time/Efficacy

The teachers noted that it had taken them a considerable amount of time to prepare the packets and to prepare for the workshops. All mentioned that much of this time was spent in considering and selecting options, as well as actually putting together the materials. A fair amount of thought went into the best way to approach the concept they were presenting. They felt, however, that the time spent was balanced by the fact that their unit planning in mathematics was done for a four-week period ahead of time. They also felt that, if they were to repeat this process on the same topic in the following year, the task would be quite simple.

Suggestions for the Future

Several suggestions for change in future tutoring programs were discussed by the teachers. The most obvious was the possibility of expanding the program to include other intermediate teachers and

students in the school. Since the teachers considered the tutoring to be beneficial to their students and also instrumental in their growth as teachers and as colleagues they felt confident they would like to promote the program in the following year. They felt that a comfortable frequency would be two tutoring sessions, one in the Fall and one in the Spring, with an expanded time-line of six-week, rather than four-week sessions. As a direct result of a few grade six students coming to the parent workshops with their parents, even though they were not invited to participate in the session, teachers also explored the idea of including students in the workshop sessions. All teachers thought that it might be valuable to do so, having the students work in partner pairs with their respective parent. The rationale was that this format would promote even greater communication and working relationships between the child and his/her parent, something that might transfer over to the home environment.

Another suggestion, evolving from the obvious parental reluctance to leave at the end of the workshops, was that the last ten minutes of each workshop should include a 'rap' component. An additional avenue explored, one initiated by parents and followed up by teachers, was the possibility of using a similar format to present more general workshops. These could be presented to all interested parents at, for example, a parents' consultative meeting. A specific topic which seemed to generate interest was the use of metrics within the mathematics curriculum. Teachers felt that this was a workable idea and could be a valuable offshoot of the program, but should not

replace the tutoring workshops themselves. A final noteworthy observation, generating from parent questions and teacher responses, was that teachers felt that the program could easily be adapted to include other curricular areas.

CHAPTER FIVE: RESEARCH FINDINGS FROM QUANTITATIVE DATA

The quantitative analyses are based on the data results from two separate sources; the pretest and posttest scores of both the experimental (tutored) group and the control (non-tutored) group and the questionnaires distributed to all participants involved in the tutoring program.

Pretest/Posttest Scores

Hypothesis: Children who are tutored by their parents will make greater achievement gains than comparable students who are not tutored.

Analyses

The general purpose of this analysis was to determine whether or not achievement benefits accrued to those students who received tutoring by their parents. In order to establish that the tutored (experimental) and non-tutored (control) group were equivalent in terms of achievement prior to tutoring, a non-parametric sign test was utilized to compare the medians of the two groups (see Table 3 for the reported medians). This test, rather than the corresponding parametric t test was indicated for comparison, as the grades four and six tests were different in content and scale. The value of chi square for the pretest scores (see Table 4) was .90 ($df = 1, p > .05$). Since no statistically reliable differences were found on students' pretest achievement, it can be concluded that the experimental and control groups began the study on equal footing.

TABLE 3

Median Scores for Pre and Posttests

(n = 40)

	<u>Pretest</u>	<u>Posttest</u>
Grade 4	8.5	29.5
Grade 6	9.5	13

TABLE 4

Nonparametric Median Test on Pretest Scores

(n = 40)

	+	-	
Control	9	12	21
Experimental	11	8	19
	20	20	

$$\text{Chi}^2 = .90 \text{ (df1)}$$

$$(\underline{p} > .05)$$

The small sample size in the study requires particularly careful attention to possibly confounding variables. One such variable is student absenteeism during the study. Differentially higher student absenteeism in the control group would serve to artificially lower the posttest mean for this group and exaggerate treatment benefits. Similarly, higher student absenteeism in the experimental group would

tend to artificially reduce any treatment effects. In order to address this issue, a t test was conducted on the rate of student absenteeism between the two groups (see Table 5). The mean absence for the control group was 1.12 days, and for the experimental group 1.63 days, resulting in a t value of -0.81 ($p > .05$). Absenteeism between the two groups was essentially equivalent.

TABLE 5

Means, Standard Deviation and T-Test Results for Student Absence

<u>Non-tutored Students</u>		<u>Tutored Students</u>		
(n = 21)		(n = 19)		
M	S.D.	M	S.D.	t
1.12	1.42	1.63	2.39	-0.81
(p = .42)				

With the establishment of group equivalence on pretest achievement, a sign test comparison of posttest medians provides a clear assessment of tutoring effects (see Table 6). The result of the sign test conducted on posttest medians revealed a significant difference in posttest performance in favour of the tutored group ($\chi^2 = 4.91, df = 1, p < .05$).

In order to ascertain whether or not there was a relationship between the tutoring time and the differences between the pretest and posttest scores of the experimental group, a Pearson correlation technique was utilized. The tutoring time was coded as follows to provide a more suitable distribution for analysis: less than 200

minutes = 1, 201 to 300 minutes = 2, and 301 to 400 minutes = 3. Results indicated that there was a positive, but statistically nonsignificant correlation between these two variables ($r=.22$; $p=.18$). Given the small sample size ($n=19$) and resulting low statistical power, this finding at least hints at a possible relationship between tutoring time and children's posttest achievement.

TABLE 6

Nonparametric Median Test on Posttest Scores

(n = 40)

	+	-	
Control	7	14	21
Experimental	13	6	
	20	20	

$$\text{Chi}^2 = 4.91 \text{ (df1)}$$

$$(p < .05)$$
Summary

In view of the fact that a significant positive difference was found in favour of the posttest results of the experimental group, the hypothesis has been satisfied. Although no significant relationship was shown for the experimental group between pretest and posttest differences and the amount of individual tutoring time, in view of the the small sample size, the positive relationship indicated invites further investigation.

Questionnaires

Hypothesis: Participants in the program (students, parents, teachers) will perceive the program to be efficacious.

In general, the results from all three participant groups were overwhelmingly positive (see Tables 7-11 inclusive). This indicates that the statistical data from the questionnaires support the hypothesis. In viewing the data, some of the questionnaire responses are revealed to be less positive than others. It is these questions which appear to merit attention in a discussion of the results. They may provide pertinent information for implementation of similar programs and perhaps suggest direction for future research. This analysis concentrates on those questions which elicited less than 80% support.

Student Questionnaire (see Table 7)

Three questions in the student questionnaire received less than the criterion of 80% support - numbers one, two, and seven. The first two questions involved the students' mathematics work in class. For question number one, 36.84% of the students stated that they did not understand their mathematics work in class better than they did previous to the tutoring program. This seemed to contradict somewhat their 94.74% support for question number three - that they felt more confident about mathematics now than before the tutoring program. It is interesting to note that all of the "no" respondents to question number one answered in the positive for question number three

TABLE 7

Student Questionnaire

<u>Question</u>	<u>% Yes</u>	<u>% No</u>
1. I understand my math work in class better than before the tutoring program.	63.16	36.84
2. I look forward to math in school more now than before the tutoring program.	68.42	31.57
3. I feel more confident about math now than before the tutoring program.	94.74	5.26
4. My parent can help me better now than before the tutoring program.	89.47	10.53
5. I will ask my parent for help more now than I did before the tutoring program.	84.21	15.79
6. I liked working on math with my parent during the tutoring program.	100.00	0.00
7. I would like to participate in a tutoring program again.	78.95	21.05

(confidence). In other words, even though the students felt they did not understand their math work better, they felt more confident about it. It also may be significant that four of the seven "no" responses for question number one were from one class - a grade four class. There may have been a reason inherent to this class why the students were not able to connect the tutoring material to their class work. In fact, this teacher deviated somewhat from the program design, teaching the content in class and then using it as tutoring material the following week, rather than concurrently, as the program outlined. This variation in approach was not discovered until well into the program.

The second question measured whether or not the students looked forward to math in school more than they did previous to the tutoring program. Of the students, 31.57% stated that they did not. Again, all students who answered this question in the negative had given a positive response to the third question - that they felt more confident about math than they did previous to the tutoring. In other words, even though they felt more confident about math since the tutoring experience, the actual subject had not increased in its appeal. In seeking a relationship between questions one and two, understanding and looking forward to school math, there is no consistent pattern between the negative responses. Only three of the seven students who indicated that they did not understand their work better also reported no improvement in their attitude toward math. Again, three of the six negative responses to question number two were from the aforementioned grade four class.

The last question for discussion, a fairly significant one in terms of the program's future success, was whether or not the students would like to participate in a tutoring program again. Although the response was significantly positive (78.95%), the program had failed to gain the future support of 21.05% of its participants.

In summary, the student questionnaire responses showed a high degree of support from its participants. Particularly significant, perhaps, is the fact that 100% of the students reported that they liked working on math with their parents during the program. It was obviously an enjoyable experience for the children. This was

supported by parent comments (see Chapter Four) and the parent questionnaire results. Also noteworthy is the high support for questions four and five, indicating that the children felt that their parents were better able to help them since the program and that they would seek parental help more than they would have done prior to the program.

Parent Questionnaire

Part A (see Table 8). This part of the questionnaire dealt with the parents' perception of the value of the tutoring sessions. It

TABLE 8

Parent Questionnaire (Part A)

<u>Question</u>	<u>% Yes</u>	<u>% No</u>
1. I feel more able to help my child with math now than I did before the program.	84.21	15.79
2. I would volunteer to participate in a home-tutoring program again.	94.74	5.26
3. My child now understands his/her math homework better than before the program.	89.47	10.53
4. My child approaches his/her math homework with more confidence than before the program.	94.74	5.26
5. My child is more enthusiastic now about doing math homework than before the program.	63.16	36.84
6. I believe that I will be more inclined to help my child with math in the future.	89.47	10.53

covered both their own feelings in the role of tutor and their perceptions of the effect the tutoring had on their children. Only one question gained less than 80% participant support. This was

question number 5, which referred to the parents' perception of their children's enthusiasm about doing math homework. Of the parent participants, 36.84% reported that they did not think their child was more enthusiastic about doing math homework at the end of the program than he or she was prior to its onset.

Part B (see Table 9). Part B of this questionnaire dealt with parent response to the tutoring training workshops. The results were overwhelmingly positive. Four of the questions indicated 100% participant support and no questions showed less than 80%.

TABLE 9

Parent Questionnaire (Part B)

<u>Question</u>	<u>% Yes</u>	<u>% No</u>
1. The directions given during the workshops were clear and easy to follow.	94.74	5.26
2. The workshops prepared me to help my child.	89.47	10.53
3. The guidelines were clear.	100.00	0.00
4. The guidelines contained sufficient information.	100.00	0.00
5. Any questions I had were answered.	100.00	0.00
6. The teacher seemed to value parents' ideas.	94.74	5.26
7. The teacher helped parents feel comfortable in the workshop situation.	100.00	0.00

Teacher Questionnaire

Part A (see Table 10). This part of the questionnaire dealt with teacher perception of parental understanding and acceptance of the

tutoring role and subject content. All three questions were given 100% support.

TABLE 10

Teacher Questionnaire (Part A)

<u>Question</u>	<u>% Yes</u>	<u>% No</u>
1. The majority of parents appeared to understand the subject content presented.	100.00	0.00
2. The majority of parents appeared to understand the tutoring role expected of them.	100.00	0.00
3. The majority of parents appeared to accept the tutoring role expected of them.	100.00	0.00

Part B (see Table 11). The last part of this questionnaire covered teacher perception of the tutoring effect on student class performance, teacher collegiality, tutoring benefit in terms of class time saved, and parent-teacher communication. Eight of the ten questions were answered positively. Of the remaining two, one (number one) received a 75% positive response while the other (number three) showed only 50% support. Both of these questions merit comment. Question number one asked whether the students participated more in oral classroom discussion than they did previous to the program's institution. One teacher felt that, although one or two students participated more, the majority did not. The other question, "the tutored students' increased understanding allowed me to move more quickly in my program", was discussed with the co-ordinator by the two teachers who gave a negative response. They said that they found this question difficult to answer for the following reason. Although the tutored students' increased understanding would have enabled them to

move more quickly, they did not do so in order to keep pace with the tutoring schedule set up with parents. This point was referred to in Chapter Four.

TABLE 11

Teacher Questionnaire (Part B)

<u>Question</u>	<u>% Yes</u>	<u>% No</u>
1. The tutored students participate more now in oral discussion than before the tutoring program.	75	25
2. The tutored students now show a better understanding of their classwork than they did before the tutoring program.	100	0
3. The tutored students' increased understanding allowed me to move more quickly in my program.	50	50
4. The tutored children now require less individual assistance than before the tutoring program.	100	0
5. The tutored children now show more confidence and enthusiasm about their math than before the program.	100	0
6. The collegiality involved in the teacher planning sessions promoted more consistency of approach between teachers than before the tutoring program.	100	0
7. The collegiality involved in the teacher planning sessions resulted in growth in my own teaching.	75	25
8. Through using group parent training, I saved time I would normally spend with individual students.	100	0
9. Through working with parents, I gained an increased understanding of their concerns.	100	0
10. I would use this home-tutoring model again.	100	0

CHAPTER SIX: SUMMARY AND IMPLICATIONS

Implications for Participants

This study, in terms of both qualitative and quantitative data, was successful in meeting the hypotheses. All three participant groups--students, parents, and teachers--derived benefit from the program. The project resulted in a home/school learning partnership which not only increased student achievement but was perceived as efficacious by all its participants.

Student Participants

On the basis of the statistical analysis it is evident that the students benefited academically from the tutoring program. It would appear that home tutoring, for these mostly low-achieving math students, provided the needed additional reinforcement to enable them to keep pace with classroom learning. They were able to solidify prerequisite skills at home before proceeding to the next classroom lesson. This supports Epstein and Becker's (1982) contention that "parental assistance that provides extra time for learning may be one of the few techniques that can bring a slow student up to grade level" (p. 111). This outcome, therefore, would indicate the importance of directing future tutoring programs specifically toward these lower-achieving students. It also supports research cited in this report which indicates that parents of low-achieving students are ready and able to help their children if they are given some

support and guidance (N.E.A. Gallup Poll, 1980; Epstein, 1984b; Rich, 1984).

Another important benefit to students, as revealed by both the qualitative and quantitative data, was their apparent increased confidence toward mathematics. If this type of intervention (parent tutoring) were applied consistently throughout a child's education, one would expect a higher confidence level to positively affect his/her motivation, and hence performance, over a long-term period.

The third benefit is a potential one which would affect both the tutored students and their classmates. It stems from the observation by teachers that they needed to decrease their normal instructional pace during the tutoring period, an outcome which they attributed to the increased understanding of the tutored students. The possible implication of this would be that with a solid tutoring program in place greater content coverage might be possible for an entire class.

Teacher Participants

Two benefits to teachers merit mention. The first was the increased collegiality which evolved out of the program - teachers were learning from each other as a direct result of the workshop planning sessions. Two outcomes of this collegiality are probable: an increase in articulation in the subject area and a desire to investigate the advantages of collegiality in other subject areas. In other words, this might provide the impetus to gradually establish

the norms of experimentation and collegiality critical to successful schools (Little, 1982).

A second benefit to teachers was their perception of an increase in parent/teacher communication focussed on children's success in school. They felt that this communication narrowed the gap between home and school - that each environment was more able to reinforce the other to increase the children's learning. In comparing this form of communication with other more traditional methods, teachers found that more opportunity existed for two-way communication and in-depth sharing, indicating the possible superiority of this type of home-school partnership. Epstein and Becker (1982) note that one of the reasons "so many teachers and principals conduct and support visit-school nights and parents' conferences is that these activities have become formal, accepted strategies for parent-teacher exchanges" (p.113). They conclude that there is a need for standardizing techniques for parent involvement in home-learning activities, so that there are clear expectations - that these activities become as familiar as the traditional parent-teacher events.

Parent Participants

Qualitative data relating to parents revealed two important benefits: an improved working relationship with their children and an increased understanding of classroom curriculum and learning strategies. These two benefits have important long-term implications. Parents of students involved in home-tutoring programs will be more

likely to provide assistance in the future as a result of an improved working relationship. It would be expected, as well, that the techniques which facilitated the improved working relationship with the tutored child would transfer to home-learning interactions with younger siblings. Parents who have participated in structured home tutoring programs will also be able to provide more knowledgeable and effective assistance to their children - a transfer would be expected when they begin to work with younger children. Another implication is that their increased sense of efficacy in a tutoring role might give them the confidence to continue to assist their child as he/she moves up into higher grades.

Implications for Research

Although this study was sufficient in design and duration to provide evidence of intervention impact, further research studies should extend both the duration and breadth of design utilized. Evaluating student progress in a tutoring program encompassing a full school year would provide a more reasonable period in which to expect a solid intervention impact. Further long-term follow-up over another two-year period would give evidence of whether or not gains were maintained. Increasing the size of the study to more than one school and a larger number of participating classes would also result in a broader data base, thereby increasing the validity of the outcomes.

Within this study, there was no provision for measuring the quality of tutoring, nor the accuracy of parental records of tutoring

time spent. A smaller study with several researchers could provide information on parent/child interaction during the actual tutoring period as well as accurate documentation of the tutoring time. This type of study would yield valuable information for future programs. Several researchers (Collins et al., 1982; Epstein, 1984a; Moles & Collins, 1981) mentioned the need for research focussed on the tutoring process. Another valuable research pursuit would be to study the sibling/parent home learning interaction to determine if increased parent curriculum knowledge and tutoring skills are transferred to their academic assistance with younger children.

Implications for School/District/University Administration

In order to increase the number of academic home/school partnerships such as this one within our schools, changes both in attitude and practice will need to occur. These changes, if they are to be far-reaching, will require initiation and reinforcement at the upper levels of educational institutions. Universities, or teacher-training institutions need to address the importance of including a parent involvement component in one or more of their courses. This training should include, as Stallworth and Williams (1984) note: awareness building, knowledge of models and approaches and, finally, implementation skills. Teachers will need to develop the skills inherent in working with adults, in addition to those involved in working with children. Professional-Development

in-service within school districts will need to include this type of training and experience as well.

At the school level, experience with this study and related research has shown a need for a program co-ordinator responsible for scheduling, parent meetings, paperwork, and program assessment. Although a classroom teacher could undertake this role, in view of the increasing demands of their workload it would seem more feasible to utilize the services of an educator whose job includes this responsibility. Considering the position of a learning assistance teacher for this role would appear to be a logical extension of his/her job description. At present these teachers already work with students experiencing academic difficulty and have extensive contact with their respective parents to gain academic home support. Tizard (1982) suggests that utilizing a learning assistance teacher in the role of co-ordinator for home-learning partnerships might have more far-reaching benefits to students than the current practice of working with individual students or small groups. In other words, learning assistance teachers in this role would be able to reach a wider clientele of students and parents than they do at present.

The role of the school administrator is critical in home/school learning partnerships. It should include promotion of the concept to gain acceptance with both teachers and parents. This would imply support and encouragement for teachers to develop professionally in the area and to initiate, or participate in, such programs within the school. In addition, the administrator could promote the use of

learning assistance teachers in the role of Home Tutoring Program Co-ordinators. The principal could also assist with the organization and implementation of the program. In pragmatic terms, administrators could facilitate articulation of tutoring content through freeing teachers to meet and discuss workshop content. The program might also fit into a co-operative planning model whereby librarian input and assistance is utilized - a role which administrators could encourage.

Ultimately, a parent tutoring program such as this one offers the administrator a unique opportunity to increase the academic achievement of his/her lower-achieving students while concurrently strengthening and expanding the home/school partnership within the school. At the same time, he/she would be broadening the role of learning assistance teachers to reach more children and parents while increasing the collegiality and articulation within the school. This program offers the school administrator an opportunity to initiate a strong, substantial effect on the academic environment of the school; one which would involve bringing all the school's participants together in a common focus - to help children learn.

APPENDIX A

Introductory Letter to Parents

Dear

During the month of _____ a Parent Home Tutoring Program in Mathematics is being instituted by four teachers at our school. It is based on research which shows that parent tutoring can positively affect the academic achievement of students. The model itself was influenced by three factors:

- a) many students experience difficulty with Mathematics.
- b) many parents would like to help their children but are unfamiliar with current methods.
- c) many teachers are aware of the value of parental assistance but are unsure of how to develop an effective parent assistance program.

Your child has been selected by his or her teacher to participate in this program, providing you are interested in fulfilling the accompanying parental role. Participation will require your attendance at an initial hour-long workshop in early _____ given by your child's class teacher, followed by another workshop mid-way through the month. You would tutor your own child at home three times a week for four weeks.

An Introductory Meeting for parents outlining the program will be held on _____ in the library from _____ - _____ p.m. If you indicate at the bottom of this letter that you would like your child to participate in this program we will assume an informal commitment on your part. A formal commitment, however, will not be asked for until _____ when you receive full details of the program.

As teachers, we are excited at the prospect of working together with you to see if we can increase your child's academic achievement in a specific mathematics area.

Participating Teachers:

Sincerely,

Coordinator

Principal

(Please return this portion)

I am interested in participating in the Parent Tutoring Program
with my child and will attend the Introductory Meeting for Parents on

YES _____ NO _____

Parent's Signature

Pupil's Name

Teacher

APPENDIX B

Parent Tutoring: Implementation and Analysis of a Program for
Average and Low-Achieving Mathematics Students

Purpose:

To determine whether parent tutoring will increase the academic success of a select group of average and low-achieving mathematics students.

Goal:

To provide additional, effective instructional time for students at critical times in their learning (introduction of new major concepts).

Based On:

Research which shows that parent involvement in instruction positively influences the academic achievement of students.

Roles:

Student:

- participate in tutoring sessions
- participate in evaluation of program

Parent:

- attend two designated meetings and two workshops
- tutor own child for two, two-week periods
- participate in evaluation of program

Teacher:

- recruit parents, provide program rationale and obtain commitment from students and parents
- plan and implement meetings and workshops
- assess student achievement growth
- evaluate and monitor program

Time Allocations:

Jan. 26 Introductory Meeting for Parents

Feb. 2-13 Parent Workshop A

Home Tutoring (30 minutes 3 times per week)

Feb. 16-27 Parent Workshop B

Home Tutoring (30 minutes 3 times per week)

Mar. 2-6 Teacher/Parent Evaluation Meeting

Application:

Assuming positive results, this model could be used in any subject area to complement classroom instruction and increase student success.

APPENDIX C

Evaluation of Tutoring Program: ParentsI. Pre-tutoring Program

I helped my child with school work at home (X)

Frequently ___ Occasionally ___ Rarely ___

II. During Tutoring ProgramFrequency

I worked with my child (please fill in information)

Week	# of Times	Length of Time
------	------------	----------------

1

2

3

4

APPENDIX D

Letter to Parents Requesting Evaluation

School

Dear Parent/Guardian:

Enclosed with this letter you will find a form requesting your evaluation of the parent tutoring program. You will note that your form has been assigned a code number. This code will allow the computer to connect children's test scores to parent perceptions of the program in order to see if there is any relationship. Teachers, including myself, do not have access to the code. This is to protect your anonymity and allow you to make a free response. Once the computer has recorded the information, all response sheets will be destroyed, guaranteeing anonymity.

Please return the form in a sealed envelope directly to the office by Friday, February 27. It should be marked "Parent Tutoring Program". It is crucial that we receive a returned form from each parent by this date. Otherwise, much of the collected data will not be useful and a full evaluation of the program will not be possible. We will be using this data to provide you with information at the Program Evaluation on Monday, March 2, 1987.

Please bring your filled-in copy of the form containing the amount of time you have spent with your child to the Evaluation Meeting on Monday.

Thank you for your cooperation and assistance. See you on Monday.

Sincerely,

Coordinator, Parent Tutoring Program

APPENDIX E

Evaluation of Tutoring Program: Parents

Parent Tutoring Program: _____ School

The purpose of the following section is to gain feedback from you regarding the program's merit. The questions seek information regarding the effect of tutoring on your child and your own role as tutor.

A. My judgement of the value of the program (please circle YES or NO)

- | | | | |
|----|---|-----|----|
| 1. | I feel more able to help my child with Math now now than I did before the program. | YES | NO |
| 2. | I would volunteer to participate in a home-tutoring program again. | YES | NO |
| 3. | My child now understands his/her Math homework better than before the program. | YES | NO |
| 4. | My child approaches his/her Math homework with more confidence than before the program. | YES | NO |
| 5. | My child is more enthusiastic now about doing Math homework than before the program. | YES | NO |
| 6. | I believe that I will be more inclined to help my child with Math in the future. | YES | NO |

The purpose of the following section is to gain feedback from you regarding the workshops' merit.

B. My judgement of the value of the workshops (please circle YES or NO)

- | | | | |
|----|--|-----|----|
| 1. | The directions given during the workshops were clear and easy to follow. | YES | NO |
| 2. | The workshops prepared me to help my child. | YES | NO |
| 3. | The guidelines were clear. | YES | NO |

- | | | | |
|----|--|-----|----|
| 4. | The guidelines contained sufficient information. | YES | NO |
| 5. | Any questions I had were answered. | YES | NO |
| 6. | The teacher seemed to value parents' ideas. | YES | NO |
| 7. | The teacher helped parents feel comfortable in the workshop situation. | YES | NO |

APPENDIX F

Evaluation of Tutoring Program: Students

The purpose of this form is to find out from you whether or not you find the Math tutoring has helped you.

Please circle Yes or No.

- | | | | |
|----|--|-----|----|
| 1. | I understand my Math work more now than before the tutoring program. | YES | NO |
| 2. | I look forward to Math in school more than before the tutoring program. | YES | NO |
| 3. | I feel more confident about Math now than before the tutoring program. | YES | NO |
| 4. | My parent can help me better now than before the tutoring program. | YES | NO |
| 5. | I will ask my parent for help more now than I did before the tutoring program. | YES | NO |
| 6. | I liked working on Math with my parent during the tutoring program. | YES | NO |
| 7. | I would like to participate in a tutoring program again. | YES | NO |

APPENDIX G

Evaluation of Tutoring Program: Teachers

Please circle YES or NO

I. My Judgement of Parent Understanding of Content and Process:

- | | | |
|---|-----|----|
| 1. The majority of parents appeared to understand the subject content presented. | YES | NO |
| 2. The majority of parents appeared to understand the tutoring role expected of them. | YES | NO |
| 3. The majority of parents appeared to accept the tutoring role expected of them. | YES | NO |

II. My Judgement of the Value of the Program:

- | | | |
|--|-----|----|
| 1. The tutored students participate more now in oral discussion than before the tutoring program. | YES | NO |
| 2. The tutored students now show a better understanding of their classwork than they did before the tutoring program. | YES | NO |
| 3. The tutored students' increased understanding allowed me to move more quickly in my program. | YES | NO |
| 4. The tutored children now require less individual assistance than before the tutoring program. | YES | NO |
| 5. The tutored children now show more confidence and enthusiasm about their Math than before the tutoring program. | YES | NO |
| 6. The collegiality involved in the teacher planning sessions promoted more consistency of approach between teachers than before the tutoring program. | YES | NO |
| 7. The collegiality involved in the teacher planning sessions resulted in growth in my own teaching. | YES | NO |
| 8. Through using group parent training, I saved time I would normally spend with individual students. | YES | NO |

- | | | |
|---|-----|----|
| 9. Through using group parent training, I saved time I would normally spend with individual students. | YES | NO |
| 10. I would use this home-tutoring model again. | YES | NO |

APPENDIX I

Posttest: Whole Numbers Multiplication

Name: _____

Date: _____

Grade Four

Multiply

A.

6	7	8	9	7	5
<u>x5</u>	<u>x6</u>	<u>x5</u>	<u>x8</u>	<u>x1</u>	<u>x0</u>
—	—	—	—	—	—

B. $3 \times 5 \times 6 = \underline{\quad}$

$3 \times 5 \times 8 = \underline{\quad}$

$7 \times 2 \times 2 = \underline{\quad}$

$7 \times 4 \times 6 = \underline{\quad}$

C. $6 \times 40 = \underline{\quad}$

$20 \times 40 = \underline{\quad}$

$7 \times 800 = \underline{\quad}$

$50 \times 700 = \underline{\quad}$

D. $12 \times 4 = \underline{\quad}$

$14 \times 6 = \underline{\quad}$

$26 \times 3 = \underline{\quad}$

$63 \times 4 = \underline{\quad}$

E.

52	74	17	56
<u>x60</u>	<u>x50</u>	<u>x30</u>	<u>x70</u>

F.

58	69	26	86
<u>x2</u>	<u>x3</u>	<u>x5</u>	<u>x6</u>

G.

45	39	74	59	87
<u>x58</u>	<u>x34</u>	<u>x32</u>	<u>x46</u>	<u>x41</u>

H.

28	33	47	63	28
<u>x56</u>	<u>x15</u>	<u>x26</u>	<u>x82</u>	<u>x63</u>

APPENDIX I

Posttest: Whole Numbers Multiplication

Name: _____

Date: _____

Grade Four

Multiply

A.

6	7	8	9	7	5
<u>x5</u>	<u>x6</u>	<u>x5</u>	<u>x8</u>	<u>x1</u>	<u>x0</u>
—	—	—	—	—	—

B. $3 \times 5 \times 6 = \underline{\quad}$

$3 \times 5 \times 8 = \underline{\quad}$

$7 \times 2 \times 2 = \underline{\quad}$

$7 \times 4 \times 6 = \underline{\quad}$

C. $6 \times 40 = \underline{\quad}$

$20 \times 40 = \underline{\quad}$

$7 \times 800 = \underline{\quad}$

$50 \times 700 = \underline{\quad}$

D. $12 \times 4 = \underline{\quad}$

$14 \times 6 = \underline{\quad}$

$26 \times 3 = \underline{\quad}$

$63 \times 4 = \underline{\quad}$

E.

52	74	17	56
<u>x60</u>	<u>x50</u>	<u>x30</u>	<u>x70</u>

F.

58	69	26	86
<u>x2</u>	<u>x3</u>	<u>x5</u>	<u>x6</u>

G.

45	39	74	59	87
<u>x58</u>	<u>x34</u>	<u>x32</u>	<u>x46</u>	<u>x41</u>

H.

28	33	47	63	28
<u>x56</u>	<u>x15</u>	<u>x26</u>	<u>x82</u>	<u>x63</u>

d) 0.62 0.68 0.60
 _____ _____ _____

7. Round each decimal to the nearest whole number.

a) 5.7 _____ c) 62.0 _____
b) 112.5 _____ d) 10.1 _____

8. Round each number to the nearest tenth.

a) 0.11 _____ c) 1.86 _____
b) 0.75 _____

9. Round each number to the nearest hundredth.

a) 0.261 _____ c) 16.781 _____
b) 0.504 _____

10. Round each number to the nearest thousandth.

a) 8.0638 _____ c) 0.7065 _____
b) 5.9208 _____

APPENDIX K

Decimal PosttestScore
25

Name: _____

Date: _____

Grade Six

1. Circle the phrase that tells what the 5 in 3.05 means.

5 ones

5 tenths

5 hundredths

2. Write a decimal for seven and two tenths. _____

3. Circle the phrase that tells what the 5 in 84.135 means.

5 hundredths

5 thousandths

5 ten-thousandths

4. Write a decimal for 671 thousandths. _____

5. Compare the numbers. Use > or < or =

a) 3.17

5.29

c) 7.01

7.1

b) 12.5

12.32

d) 6.43

6.430

6. Write the decimals in order from least to greatest.

a) .52

.38

.25

b) 9.31

9.3

9.406

c) 6.305 6.038 6.1038

d) .029 .4691 .0046

7. Round each decimal to the nearest whole numbers.

a) 6.2 _____ c) 49.2782 _____

b) 12.7 _____ d) 12.5 _____

8. Round each number to the nearest tenth.

a) 0.14 _____ c) 2.35 _____

b) 12.496 _____

9. Round each number to the nearest hundredth.

a) 0.26104 _____ c) 7.0965 _____

b) 10.39846 _____

10. Round each number to the nearest thousandth.

a) 4.0439 _____ c) 0.7418 _____

b) 6.29864 _____

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