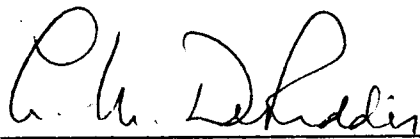


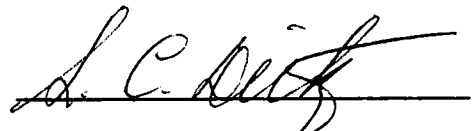
To the Graduate Council:

I am submitting herewith a thesis written by Wayne Edward Finnell entitled "The Effects of Role Modeling and Peer Tutoring on Ninth Grade Basic Mathematics Students' Achievement, Self Concept and Attrition." I recommend that it be accepted in partial fulfillment of the requirements for Specialist in Education, with a major in Educational Psychology and Guidance.



L. M. DeRidder, Major Professor

We have read this thesis and
recommend its acceptance:





Accepted for the Council:



Vice Chancellor
Graduate Studies and Research

Thesis
79
.F555
cop. 2

THE EFFECTS OF ROLE MODELING AND PEER TUTORING ON NINTH GRADE
BASIC MATHEMATICS STUDENTS' ACHIEVEMENT,
SELF CONCEPT AND ATTRITION

A Thesis
Presented for the
Specialist in Education
Degree
The University of Tennessee, Knoxville

Wayne Edward Finnell

August 1979

1396890

ABSTRACT

Northwest High School has a dropout rate of 50 percent and a Basic Mathematics failure rate of 42 percent. A random selection of 25 ninth grade students received peer tutoring; another 25 received role modeling, in addition to the regular Basic Mathematics program. A control group of 25 randomly selected ninth grade students was used. A total of 75 students were involved for spring quarter which is 60 teaching days in length. The three groups were used to compare mathematics achievement, self concept, and dropout rate. The testing instruments were both locally made. The role models received some training but the peer tutors received no training. A pretest-posttest design was used to test the hypotheses concerning mathematic achievement and self concept. No significant differences were found between the groups on any question except between the groups' dropout rates.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Purpose of Study	2
Null Hypotheses	4
Assumptions and Limitations	4
Definitions	5
Need for Study	6
II. REVIEW OF THE LITERATURE	7
III. METHODS AND PROCEDURES	28
IV. RESULTS	31
V. DISCUSSION	37
Recommendations	38
REFERENCES	40
APPENDIXES	45
APPENDIX A	46
APPENDIX B	48
VITA	52

LIST OF TABLES

TABLE	PAGE
1. Analysis of Covariance of Mathematics Achievement Scores for the Peer Tutoring Group, the Role Modeling Group, and the Control Group	32
2. Analysis of Covariance of Self Concept Scores for the Peer Tutoring Group, the Role Modeling Group, and the Control Group	32
3. 2 × 2 Contingency Table for Number of Dropouts and Nondropouts for the Role Modeling Group and the Control Group	33
4. 2 × 2 Contingency Table for Number of Dropouts and Nondropouts for the Peer Tutoring Group and the Control Group	35
5. 2 × 2 Contingency Table for Number of Dropouts and Nondropouts for the Peer Tutoring Group and the Role Modeling Group	35
6. 2 × 3 Contingency Table for the Number of Dropouts and Nondropouts for the Peer Tutoring Group, the Role Modeling Group, and the Control Group	36
7. Analysis of Covariance of Gains in Mathematics Achievement between Previous Quarter and Experimental Quarter	36

CHAPTER I

INTRODUCTION

Many authors have written much about identifying potential dropouts, but little research has been done to increase a school's holding power. Although no one factor has been identified as being more influential in determining whether a student stays in school or drops out, the results of several studies indicate that academic failure is one of the main contributing factors to a student dropping out of school. Low reading and arithmetic ability, in turn, have been identified as the contributing causes of the failure of these dropouts (Anderson, 1964).

In an effort to reverse the dropout rate, Adwere-Boamah (1975) developed a project (Project Mack) which used peer tutoring to increase mathematics and reading achievement. Poor self concept was also identified as a contributing factor to the dropout problem. As a result of the project, significant gains were made on reading and mathematics achievement test scores. Project Mack reduced the dropout rate at the project's high school from 16.1 percent to 6.2 percent during the school year 1974-75.

Siegleman (1975), directing the Summer Mathematics Remediation for Incoming Pupils in New York City, attempted to improve student success and reduce the dropout rate. Peer tutoring was used with 3,610 ninth and tenth grade students to improve their mathematics and reading skills. Significant improvements were made in mathematics scores on the Metropolitan Achievement Test. Since this was a summer program with

students from twenty-five different high schools, no attempt was made to measure any change in the dropout rate.

I. PURPOSE OF STUDY

The results of studies indicate that peer tutoring is an effective intervention procedure in assisting students to develop basic mathematics skills. However, little research has focused upon the effectiveness of the kind of tutor, a peer or a role model, in reducing mathematics failure. Consequently, this study will examine which approach, role modeling or peer tutoring, if either, is more effective in reducing the failure rate in Basic Mathematics. This study will also measure any change in the students' self concept brought about by peer tutoring and by role modeling. Many studies list poor self concept as a contributing factor to a student dropping out (Adwere-Boamah, 1975 and Anderson, 1964). Finally, the impact of tutoring upon retention rates will be examined.

The results will be useful to Northwest in planning the mathematics program. Northwest Whitfield Comprehensive High School, located in northern Georgia, is predominately white middle class. There are approximately 1500 students in grades nine through twelve. At Northwest High School approximately 80 percent of the ninth grade students are in Basic Mathematics. The failure rate for this class is 42 percent. Counselors observe that many students that might be identified as potential dropouts express a sense of frustration concerning mathematics. Many state, if they fail to be promoted, that they will not return or will withdraw when they turn sixteen. The dropout rate for Whitfield

County is approximately 50 percent. If role modeling proves to have a significant positive effect on the failure rate, more "role model" seniors can be recruited and scheduled to work during the Basic Mathematics periods. If "peer tutoring" has significant positive effect, then classes can be reorganized in order to implement peer tutoring to all Basic Mathematics students.

The questions this study will attempt to answer include: Will peer tutoring or role modeling have a significant effect on the failure rate of Basic Mathematics students or their self concept? Is there any significant difference in mathematics achievement between the peer tutoring group and the control group? Is there any significant difference in mathematics achievement between the role modeling group and the control group? Is there any significant difference in mathematics achievement between the role modeling group and the peer tutoring group? Is there any significant difference in the students' self concept of the role modeling group and the control group? Is there any significant difference in the students' self concept of the peer tutoring group and the control group? Is there any significant difference in the students' self concept of the role modeling group and the peer tutoring group? Is there any significant difference in the number of dropouts from the role modeling group and the control group? Is there any significant difference in the number of dropouts from the peer tutoring group and the control group? Is there any significant difference in the number of dropouts from the role modeling group and the peer tutoring group?

II. NULL HYPOTHESES

1. There will be no significant difference between the experimental groups and the control group on mathematics achievement.
2. There will be no significant difference between the experimental groups and the control group on the self concept scale.
3. There will be no significant difference between the role modeling group and the control group's number of dropouts.
4. There will be no significant difference between the peer tutoring group and the control group's number of dropouts.
5. There will be no significant difference between the role modeling group and the peer tutoring group's number of dropouts.
6. There will be no significant difference between the experimental groups' and the control group's number of dropouts.

III. ASSUMPTIONS AND LIMITATIONS

The study sample of students is 99 percent white. The majority of the students' parents work as semi-skilled labor in carpet mills. Good community support for the school exists as noted by a visiting committee for the Southern Association of Schools and Colleges in the fall quarter of 1978-79.

This study was limited to the spring quarter of 1978-79. Each quarter contains sixty teaching days. The mathematics program is competency based. To be promoted a student must pass a final examination of mathematics skills. When a student is first placed in the mathematics program a placement test, similar to the final examination, is

administered. The program is divided into twelve levels covering the addition, subtraction, multiplication, and division of whole numbers, decimals, and fractions. Students move from teacher to teacher as they move from level to level. The fear of taking a test could have some influence on the study. The fact that the majority of the study's population has already failed this class during the fall and winter quarters may have some influence on their attitude concerning mathematics and their self concept. Seventy-five out of one hundred thirty-five students in the total spring quarter Basic Mathematics classes were involved in the study. Twenty-five students were placed in a control group and twenty-five in each of the experimental groups.

The mathematics achievement was measured by a test that required a minimum of 70 percent accuracy at each level in order to receive credit for that level. This final examination was developed by the head of the mathematics department based on the SRA diagnostic tests (see Appendix B). The student's self concept was measured by a survey that had thirty-six items that were answered positively or negatively (see Appendix A). A percentage of positive answers was used to measure student self concept. The survey was counselor-made and was not normed.

IV. DEFINITIONS

For the purpose of this study, a "role model" is defined as a senior that has a strong mathematical background. Each "role model" was instructed how to reward positive behavior and avoid negative actions. A "peer tutor" is defined to be a ninth grade student near the same age

as the subject. The peer tutor must have mastered the skill in which he/she helps a student receiving treatment. A "subject" is defined as a student that has failed the fifth grade level achievement test and was placed in a Basic Mathematics class for spring quarter of 1978-79. A "dropout" is defined as a student that withdrew with no immediate plans to continue their education in an accredited public or private high school. The peer tutoring group will be defined as Group I. The role modeling group will be defined as Group II. The control group will be defined as Group III.

V. NEED FOR STUDY

Northwest High School has a dropout rate and a failure rate that is unacceptable. Studies suggest that there is a relationship between failure, poor self concept and dropping out. The majority of the students dropping out of Northwest High have failed mathematics at least once. This study will help to determine whether role modeling or peer tutoring will be more facilitative in helping students to gain a more positive self concept and to improve achievement in mathematics. If the student's self concept and academic achievement can be improved, it is likely that the school's holding power can also be improved.

CHAPTER II

REVIEW OF THE LITERATURE

After critically reviewing a large number of peer tutoring studies, Devin-Sheehan et al. (1976), observed that results were less positive when the subject being tutored changed from reading to mathematics or science or some other subject. Reading is the most frequently tutored subject; mathematics is the second most tutored subject. Tutoring may be more beneficial for certain subjects and specific tutoring techniques may be more appropriate for some subjects than others. Therefore, study findings from a reading study may or may not be duplicated in a mathematics tutoring program. This review of the literature will, consequently, give more attention to recent research that discusses the use of peer tutoring and/or role modeling to enhance mathematics achievement and self concept.

Many of the studies (Olsen, 1974) that gather data on the effects of peer tutoring mathematics also attempt to measure changes in students' self concept. Some research (Schmuck, 1977) indicates that a student's academic achievements are highly correlated with their self concept. Each of the two variables, mathematics achievement and self concept, may have a positive or negative effect on the other. Thornburg (1975) conducted a study to see if, by allowing a student to experience success and positive reinforcement, the holding power of the school could be increased. The study was not designed to increase academic skills as much as it was to help students feel self worth. The results indicated

that a significant reduction occurred in the dropout rate for the experimental group as compared to a control group.

Project MACK (Adwere-Boamah, 1975) was a comprehensive program to reduce the dropout rate, to increase student achievement in mathematics and reading, and to improve student self concept at McClymonds High School in Oakland, California. Peer tutoring was used in the mathematics classes. As a result, the dropout rate was reduced from 16.1 percent to 6.2 percent. Students made significant gains over expected achievement in mathematics. However, because so many experimental factors were introduced at McClymonds, there was no way to identify which if not all factors helped bring about the decrease in dropouts.

Project Summer Remediation for Incoming Pupils (Siegleman, 1975) was designed to improve student success in mathematics and prevent dropouts. The problem was that many ninth and tenth grade students transferring to a senior high school in the New York City Public School System became discouraged and dropped out. There were 3,610 students in twenty-five high schools involved in this study. The program went from July 7, 1975 to August 1, 1975. Student aides were seniors that were expected to serve as tutors in the classrooms providing individual assistance. The student tutors were to develop a "big brother or sister" relationship with the incoming students. Some high interest classes, such as photography and shop work were provided to encourage attendance. There was a significant improvement in mathematics ability for both ninth and tenth grade students on the MAT equivalent to about half a year. This improvement was achieved during sixteen teaching days. There

was no measurement made of the mathematic achievement or dropout rate of the tutors in the Siegleman study. This is unfortunate because other studies (Tannenbaum, 1966, p. 23; Gartner et al., 1971, p. 1) indicate that the tutor benefits as much if not more from tutoring.

Another study conducted in New York was the High School Peer Tutoring (Homework Helpers) Program (Heintz, 1975). This study involved over 4,000 students that were two years or more behind grade level in reading or mathematics; additional help was given to students whose native language was not English. High school and college students were employed to serve as peer tutors. The program was conducted Monday through Thursday before and after school. Sessions were two hours long. Workshops were conducted for the tutors. The Stanford Achievement Test was used to pretest and posttest the students. The analysis of the test scores yielded significant difference at the .05 level between predicted and past test gains and actual posttest gains. The students on the average showed two months of academic achievement for every month of participation in the program. In some New York High Schools such as John Adams High School in the Queens tutors were used during the regular school day as well as after school. The students who needed help the most frequently were the ones least willing to remain after school for help.

Hassett (1974) reported on one tutoring center developed at Thomas Jefferson High School in Brooklyn for the football team. The tutors were football players or other athletes who were successful in their work. The goal of the program was to keep football players from becoming

ineligible for competition because of failure in their academic work. The Homework Helper program made it possible for the high school to field a fine football team and have a winning season.

Wing (1972) used 75 high school students identified as potential dropouts to tutor 75 elementary students in mathematics. The purpose of the study was to see if the tutoring benefited the high school students' mathematic achievement, attendance, and dropout rate. The study also measured for any significant difference in the mathematical ability of the fifth grade experimental group. Control groups were established for both the high school tutors and the fifth grade tutees. There was a significant difference, at the .05 level, found in the tutors' average mathematics grade and school attendance. There was a significant difference, at the .05 level, in the mathematics achievement of the fifth grade students. However, the difference between the high school tutors and control groups dropout rate was not significant, although the tutor group did have fewer dropouts.

The Paducah Public Schools and Louisville Public Schools in Kentucky conducted a study (Beasley, 1974) to reduce dropouts, increase mathematics achievement, improve self concept, improve reading skills, increase attendance, decrease disciplinary problems and suspension. One senior high school and a junior high from Paducah and two senior high schools from Louisville, Kentucky were used in the study. It was assumed that increased reading and mathematical ability would contribute to reducing the dropout rate and improve the students' self concept. Project components included individualized instruction, curriculum

changes, human relations training, and increased student services. Peer tutoring was used with twenty-two junior high students. No evaluation or comparison was made concerning the peer tutoring aspect of the study. All schools recorded gains in mathematics and reading. Only one school achieved a significant improvement in reading and mathematic scores in the last year of the three year study. The dropout rate decreased 25.7 percent in the three year period.

A study (Helwig and Griffin, 1974) conducted at Virginia Beach, Virginia was designed to improve the mathematical ability of ninth and fifth grade students by using peer tutoring. The ninth grade students served as tutors to the fifth grade students. The study was conducted for six weeks during the summer. Twelve ninth grade volunteers worked as tutors to twelve fifth grade volunteers. The arithmetic computation and concepts of the Stanford Achievement Test was used to establish the mean grade level of 3.9, two years below the expected national grade level of 5.9, for fifth grade students at the end of the year. A control group was used with the fifth grade students. No measurements were made concerning the ninth grade students. This is unfortunate because the authors had stated that there were expected benefits for the ninth grade tutors. The fifth grade tutees made a gain from 3.9 to 4.7 in arithmetic computation; this was significant at the .05 level of acceptance. Arithmetic concepts achievement remained 5.2 from pretest to posttest.

The Partner Learning study (Smith, 1977) involved the experimental pairing of undergraduate mathematics students to work individually and a control group who had only the typical lecture method. Students with

high scores on the pretest were paired with students with low scores. Average students were paired with other average students. Ten mathematics classes at New Mexico State University and two classes at the University of Texas at El Paso were used. The experimental and control classes used the same textbooks and had the same instructor. The exact design of this experiment was unclear. The number of students involved was not stated. Five instructors participated in the study. Students used peer tutoring before and after the lecture in the experimental groups. The control groups were given the traditional lecture method. Six pairs of classes were compared for content evaluation change scores. The pretest scores were subtracted from the posttest to obtain the content value change. Five of the peer tutoring groups had higher change scores and two were significantly higher at the .05 level. Student attitudes in regard to self concept of mathematical ability were favorably affected by Partner Learning. The high with low and average with average was the most frequently used pairing method, but two other methods were also used. The other methods of pairing were: (1) high with average and average with low, and (2) student choice. There was no difference in mathematics scores and attitudes between the differently paired peer tutored groups. Prielipp duplicated the Smith study with 20 classes of junior high students in Eugene, Oregon. Prielipp's study was stated to support the findings of the Smith study.

Elliott (1977) reports on a study by Fitz-Gibbon of the UCLA Center for the Study of Evaluation using ninth graders tutoring fourth graders in the use of fractions. The ninth graders were instructed how to tutor.

The ninth grade tutors produced significantly higher achievement than did the classroom-instructed control group. The fourth grade tutees made significant gains over the fourth grade control group. Both experimental groups still showed significant advantages over the control groups three months after the three-week experiment.

Harris and Sherman (1975) conducted a unique study investigating the effects of peer tutoring on the mathematics performances of fourth and fifth grade students. Twenty-four fourth grade students and twenty-five fifth grade students were used. The mathematics period was divided into a morning and an afternoon session. The experimental and control conditions alternated from morning to afternoon every 5 to 10 days. The mean number of problems worked per minute and mean percent correct were used to compare the peer tutored period with the control period. The math problems were the same type and difficulty for both periods. The study also compared the effects of peer tutoring and peer tutoring in combination with consequences for academic performance of the students.

The study was divided into three phases. In phase one the students in the experimental period were given 15 minutes to work in tutorial groups before the 20 minute period in which the student had to work individually on an identical sample of problems. Data was gathered from the 20 minute period. Phase one ran for 20 days with treatment changing from morning to afternoon on the tenth day. In phase two a 15 minute individual study time was added to the control period to balance for the 15 minute tutorial period. A contingent reward of additional recess time was added for 90 percent or better accuracy for both periods. Phase

two ran for 24 days with the treatment and control changing from morning to afternoon every 6 days. Phase three tested for generalization. During the tutorial and individual study periods, students were allowed to work on similar, but not identical problems, to those assigned for them to work during the 20 minute segment. The third phase ran for twenty days alternating from morning to afternoon every five days. The results of phase one showed that the mean percent correct was 10 percent higher for the tutorial period. The study found that the peer tutorial period consistently produced greater gains in mean percent correct and mean number of problems worked per minute. The study also found that although contingent rewards enhanced both control and tutorial periods; both tutorial periods remained the most effective for percent correct and number of problems worked per minute. The tutorial period was more effective in developing generalized skills in solving particular types of mathematics problems. There was no comparison between tutor and tutee scores because none were selected or identified. There were no specific training procedures for the tutors.

McCarty and associates (1977) used contingencies and peer tutoring to increase the mathematical ability of four behavior disordered adolescent residents in a psychiatric hospital. Peer tutoring and contingent reward increased the on-task time in mathematics. No measurement was made of achievement.

Herzig (1974) reported using eighth and ninth grade students, on the Hawaiian Island of Oahu, to tutor seventh grade students. The tutors also assumed the duties of typing duplicating masters, dispensing

materials and grading papers for seven mathematics classes. Tutors provided constant reassurances, explanations and praise. There was no formal evaluation made of tutor or tutee mathematical achievement but interviews of the tutors and tutees were very positive.

In the Dallas, Texas Independent School District, the tutoring program (Vassallo, 1975) started as a National Honor Society project at Bryan Adams High School. In three months the program had grown from 20 tutors helping 24 tutees to 260 participants. At the close of the 1971-72 school year 1000 tutors had helped 5000 tutees in a wide variety of subjects. After the program had started the Health, Education and Welfare Department funded the expansion of the program. Peer tutoring was believed to aid the integration process of the school system. The goal of the 1974-75 school year was to involve 10,000 students in peer tutoring. Daniel, project director, stated that the three main benefits were: (1) the number of students that were spared failure and the negative feelings associated with failure; (2) improvement in the self-concept of the tutor and tutee; and (3) increased feelings of belonging. "Even more important," states Daniel, "is the fact that one person is saying to another, 'I care enough about you to want to help.'" (p. 28).

Teachers surveyed in the Vassallo report (1975) noted increases in academic performance and student's self esteem. Many teachers concede that tutors can explain a concept that a teacher cannot seem to clarify for the student. One student interviewed stated that her math teacher was good but many times was "over her head." Clarkson's study (1975) lends support to the concept that frequently tutors can be more effective

than teachers. By tape recording peer tutoring sessions in mathematics, insight as to how students learn mathematical concepts was obtained. Tutors tend to explain concepts in more concrete terms.

Devin-Sheehan and associates (1976) critically reviewed the available published research on tutoring. Devin-Sheehan observed that anecdotal reports rather than hard data have typically been gathered from the tutorial programs. They did find some well controlled research. According to their research, trends in the data indicate that programmed tutoring in mathematics is most beneficial for students in the large inner city schools. Data from the mathematics research were inconsistent, though frequently supportive of programmed tutoring as a useful aid to classroom instruction. Among the many studies, eight studies involving the use of tutors in different mathematics studies were critically reviewed. One of the studies indicated that tutoring mathematics was also effective for rural students. Two studies supported the idea that tutoring enhanced motivation in mathematics. One study supported the idea that twelfth grade tutors were more effective than tenth or eighth grade tutors working with eighth grade tutees. The majority of the studies indicated that the tutor benefited as much or more than the tutee. Attitudinal and self concept data were less frequently reported. Four studies reported findings that were nonsignificant, and one had clear positive results between tutoring and self concept.

The Horan et al. study (1974) used 20 tutors from a twelfth grade mathematics class trained in participant role modeling to work with eighth grade students that had failed mathematics. Participant modeling

is a procedure in which the model demonstrates successive approximations to a terminal adaptive behavior and positively reinforces the tutee for exhibiting matching responses. Forty eighth grade students were randomly assigned to experimental and control conditions. Teachers were not informed as to which students were receiving the experimental treatment; teachers were not even informed that a control group existed. All students were pre and posttested on attitude toward mathematics, attitude toward school and mathematics achievement in a large group setting. Attendance figures, teacher-assigned quarter grades, teacher evaluation of attitude-behavior ratings were secured for the previous quarter and end of the program quarter for comparison.

The teacher of the class from which the senior tutors were selected agreed to positively reinforce tutor participation with points, convertible to higher grades, for each tutoring session. The tutors also received verbal reinforcement. Two training sessions were conducted to train the seniors in participant modeling. The tutors were instructed to spend the first 15 minutes of the 45 minutes demonstrating how to work the mathematic problems. The next 15 minutes the eighth grade tutees attempted to duplicate the modeled responses on similar problems. The final 15 minutes were used for feedback. Models were reminded frequently "never to be negative." Responses were to be met with liberal positive reinforcement or a matter of fact illustration of the correct procedure. Tutors met with the tutees twice a week for the last six weeks of a nine week final quarter. The control group was given pep talks and met with counselors to control the time factor. The results

indicated significant difference at the .05 level for the experimental group in teacher assigned grades; 55 percent of the experimental group received passing grades compared to 10 percent of the control group. Teachers rated attitudes and behaviors of the experimental students as improved ($p < .05$). Initial analysis of the achievement test indicated that both experimental and control group made significant improvement. A violation of the homogeneity of variance resulted from the extreme fluctuation on the part of two subjects in the control group. Removal of the two subjects and a post hoc comparison suggested that only the experimental group had improved in mathematical achievement. Student attitudes toward mathematics and school showed no significant difference. The experimental and control groups had a significant increase in attendance, but this was attributed to some external force such as improved weather conditions.

A counselor developed a program (Vriend, 1969) of supervised peer leadership (role modeling) in counseling and tutoring. There was one peer leader for every three tutees. There were 48 randomly assigned senior high students in the experimental group and 48 students in the control group. The students were predominantly black from lower socioeconomic circumstances in an inner city. Peer leaders were selected by high achievement test scores, teacher recommendations and grade point averages. Tutees were selected on the basis of low achievement test scores, teacher evaluation and low grade point averages. The expectation was that the peer leader could help the low achieving to improve their study skills and become more success oriented. Group meetings, consisting of

three peer leaders and nine tutees, met for 40 minutes once a week for 40 weeks. One peer leader and three tutees met for three 40 minute periods weekly to work on academic skills for 40 weeks. Pre and post measurements were made with the School and College Ability Test, Sequential Tests of Educational Progress, grade point averages, a planning questionnaire, and attendance data. Differences between experimental and control groups achievement test scores were significant at the .01 level for mathematics, social studies, reading and writing. Science differences were significant at the .05 level. The comparison of pre and post grade point averages were significant at the .001 level. The experimental groups also showed a significant improvement in educational aspirations and expectations. Attendance and punctuality data showed a significant improvement for the experimental group; the control showed a significant change in the negative direction.

In reviewing psychologically-oriented intervention for potential dropouts, Goodyear (1974) reported on a study using 55 fifteen-year-old potential dropouts. Groups were divided into individual counseling, group counseling, individual tutoring, group tutoring and no treatment groups. After six months both group and individual counseling showed greater pre-post change on the California Test of Personality on social adjustment. No statement was made if the differences were significant. No differences were found on grade point averages or teacher evaluation. He also reported on another study which produced a significant reduction in absences when a role model conducted discussion groups with potential dropouts.

The Mutually Aided Learning study (Cox, Gilmore, 1976) used eleventh and twelfth grade students to teach third, fourth, and fifth grade students. A three week training session was used to train the high school students. The high school students tutored math and modeled appropriate behavior to groups of four or five elementary students. The number of failures were reduced. Some teachers observed that the elementary students were much quicker to ask for help and admit they did not understand a concept with a tutor than with the regular classroom teacher.

Greenwood et al. (1974) conducted a study using 24 subjects from grades nine to twelve enrolled in a classroom for "behavioral problem" and "unmanageable" students. Four students were selected from the group to serve as peer managers to conduct small groups of programmed mathematics. Tutors were to reward appropriate behavior with praise and points. Response cost was to be used for inappropriate behavior. Points could be exchanged for admission to a reward playroom. A baseline was established for peer managers before training. An ABAB design was used. The results demonstrated that peer tutors could use contingency management in programmed mathematics after receiving instruction and modeling from the teacher. The peer tutors received points the same as the tutees for appropriate behavior. There was no analysis of mathematics skill gain.

Jordan (1977) matched a more advanced college student with a college student of less ability to tutor in mathematics. Participation was on a voluntary basis. Both tutor and tutee signed a contract for grades which required that the tutee achieve 85 percent or higher score on each subtest. In the regular class 25 percent received "A" and 19 percent

received "F." In the tutoring groups 83 percent received "A" and 7.1 percent received "F."

Osguthorpe and Harrison (1976) used 12 low-achieving second grade students that were deaf to determine if pre-remediated tutoring was effective in teaching mathematics. Two control groups were used. Control group one was a random sample of peers. Control group two was other low achievers. The experimental group was tutored by sixth grade students 20 minutes a day for two weeks. The rationale for the pre-remediate tutoring was that deaf students often are unable to keep pace with a regular class when a teacher introduces a new topic. If the deaf student was tutored in the concept before the teacher introduced it to the class the student would participate more actively and grasp the concept. As a result the tutored group performed significantly better on mathematics skills, hand raising, and question answering.

Johnson and Bailey (1974) used five fifth grade students to tutor five kindergarten students in basic arithmetic skills for 7.5 weeks. A control group was used. Pre, mid and posttesting was done. Results showed significant gains were made by the tutored group. Systematic observation of trained tutors revealed a high percentage of positive statements and low percentage of negative statements.

Arkell (1975) tested to see if the student role of tutor, clerical worker, and audio-visual operator produced any changes in students' self esteem, attitude toward school, performance in spelling and achievement in arithmetic. Two sixth grade classrooms located in separate schools were used as experimental and control groups. Tutors worked in the

subject areas of mathematics and spelling for 10 weeks. Both groups were given a pre-posttest self esteem inventory, Student School Poll, and the spelling and arithmetic subtests of the Wide Range Achievement Test. No significant differences were found on any item between the experimental and control groups.

In one public school, Howell (1978) selected 15 students in grades five through eight who were in the lowest one third of their grade level according to their arithmetic skills. Students were paired with a tutor of similar arithmetic weakness. Tutors and tutees worked on multiplication facts drills. The tutor and tutee made gains in the rate of learning multiplication facts. It was predicted that if the rate was maintained, mastery level of multiplication facts might be accomplished in as little as five hours. No control groups or tests for significance were used.

In an unpublished dissertation, Wu (1973) tested for improvement in self concept and mathematics achievement as a result of peer tutoring. Related questions were: Do high or low achieving students make better tutors? Do low achieving students improve in self concept and mathematics achievement by serving as a tutor? Do males or females make better tutors? Subjects were one hundred and fifty students enrolled in ninth grade Basic Mathematics I class. Seventy-five were randomly divided to form three groups—a group tutored by high achievers, a group tutored by low achievers, and a control group. Low achieving tutors were selected from Basic Mathematics II classes, fifty of whom were randomly divided into a tutor group and a tutor control group. High achieving tutors

were selected from Algebra II and Geometry classes. Treatment was conducted for eight weeks. Tutors received seven tutor training sessions and inservice once a week. The Comprehensive Test of Basic Skills and Sears' Self Concept Inventory were used for the pre and posttests. No significant difference was found in the self concept or academic achievement among tutees with high achieving tutors, low achieving tutors, and the control group. Significant differences were found in mathematics achievement for low achieving tutors compared to the tutor control group. Tutees with female tutors did significantly better than tutees with male tutors.

Carlson (1973), in an unpublished dissertation, used sixth grade tutors and fourth grade tutees to investigate the effects of peer tutoring on self concept and arithmetic computation achievement. Additional comparison was made to see if training tutors affected their arithmetic ability and self concept or that of their tutees. There were twenty-one trained tutors with twenty-one tutees, twenty-one untrained tutors with twenty-one tutees, eighteen control nontutors and fifteen nontutee controls. A pretest and posttest of the Coopersmith Self Esteem Inventory and the Arithmetic Computation Section of the Stanford Achievement Test were used. Treatment lasted for six weeks during regular math study period of 30 minutes. Control groups worked on worksheets during the tutoring periods. The combined group of all tutees showed significant growth in arithmetic computation. All other findings were nonsignificant.

Kenemuth (1974), in an unpublished dissertation, tested for the effects on reading achievement, and mathematics achievement, and

self concept of sixth grade students that served as tutors. Thirty-five students tutored reading, thirty-five tutored mathematics and thirty-five served as a control group. No measurements were made for tutees. Two forms of the Stanford Achievement Test were used in pre and posttesting. The Piers-Harris Self Concept Scale was used for the pre and post instrument to measure self concept gains. Treatment lasted for two months. The arithmetic tutors made no significant gains in arithmetic achievement or self concept scores.

Morrissey (1974), in an unpublished dissertation, compared five roles: (1) tutor, (2) tutor-tutee, (3) tutee, (4) self instruction, and (5) control on multiplication proficiency of fourth grade students. Low achieving students received treatment for one month, fifteen minutes a day, four days a week. Every Friday a multiplication test was administered. The findings were that all groups made comparable progress; there was no significant difference among any of the groups.

Levine (1975), in an unpublished dissertation, tested the effects of peer tutoring on the mathematics achievement, attitude toward mathematics, and the self concept of fifth grade low achievers. Eighty-nine fifth graders were divided into a group that was trained tutored, into a group that was trained and performed no tutoring and into a control group. The tutees were thirty second graders. A control group of thirty second graders was selected. Twelve training sessions were used for the tutors. Tutoring took place for five weeks for thirty minutes a day. A semantic differential test was used to measure attitude toward mathematics and self concept. A teacher-made test was used to measure mathematics

achievement. A pretest and posttest comparison was made. The findings were that both tutor groups showed statistically significant gains over the control group. No significant differences were found between the tutor group that tutored and the tutor group that received tutor training only. The second grade tutees showed significant gains in mathematical ability. No significant differences were found in attitude or self concept.

In an unpublished dissertation, Roundtree (1976) investigated the effects of tutoring mathematics on the self esteem of male prison inmates. There were twenty-two subjects in the experimental group and 31 subjects in the control group. The average prisoner was young, male, poorly educated, unskilled, IQ of 90, and had poor family background and history of alcohol and drug use. The experimental group received individual tutoring for 45 minutes twice a week for eighteen weeks. A pretest and posttest were used to measure mathematical ability and self esteem. There were significant differences in self esteem and mathematical skills for the tutored group.

Kane (1976), in an unpublished dissertation, compared mathematical achievement using managed peer tutoring to a program implemented by a Learning Disability teacher. The subjects of the study were incarcerated juvenile delinquents identified as learning disabled in computational mathematical ability. The 38 subjects ranged from 12 to 17 years old; the grade range was seventh grade to twelfth with a computational mathematical mean score of 5.8. The peer tutoring and LD teacher's program were conducted on an individual basis. The peer tutors were

selected from the school population that had a mathematics grade equivalent achievement of 9.5 or above. The peer tutors were paid \$1.25 an hour. The tutors received one week of training. The Science Research Associates Achievement Series was used for pretest and posttest comparison. The study ran for eight weeks; students had five 45 minute periods per week of classroom instruction. No significant differences were found between the mathematics achievement between the two groups.

Geer (1977), in an unpublished dissertation, investigated the effects of cross-age tutoring on the achievement and self concept of low achieving elementary students. Ninety students were randomly assigned to a control or one of six experimental groups. Tutees came from grades one through four. Fifty-six sixth grade tutors were used. The six experimental groups were (1) nonstructured tutoring in mathematics, (2) nonstructured tutoring in reading, (3) nonstructured tutoring in reading and mathematics, (4) diagnostic tutoring in mathematics, (5) diagnostic tutoring in reading, and (6) diagnostic tutoring in mathematics and reading. Tutors received two weeks of training. Treatment sessions were held for thirty minutes a day, three days a week for eight weeks. A posttest only control group was used. The Stanford Diagnostic Mathematics Test, the Stanford Diagnostic Reading Test and the Self Concept As A Learner Scale were used. The findings indicated no significant differences in mathematics or reading achievement among the different tutoring groups or control group. Cross-age tutoring did significantly improve the self concept of the experimental groups.

Amster (1975) used the Schell method of selecting and training peer tutors. Subjects were selected from four junior high schools with a

large percentage being minority students. Four hundred and twenty seventh grade students were divided into four treatment groups. The treatment group one used ninth grade peer tutors; group two used a mathematics specialist; group three used an exchange teacher and group four used the regular classroom teacher. A pre-posttest design was used to test for mathematics achievement, nonverbal reasoning and student attitudes. The mathematics section of the California Test of Basic Skills and the You and School attitude survey were used. No significant differences were found on mathematics achievement or attitudes among the groups.

Young (1975) conducted a study to reduce the dropout rate by assessing the dropout needs and designed an individual instructional program to meet their needs. A psychologist and a psychometrist developed a battery of tests to identify dropouts and their needs. As a result a remediation program in basic mathematics was developed. Peer tutors were used by the classroom teacher to use the "Success in Mathematics," a programmed individualized learning packet. There were 13 students in a test-identified experimental group, 26 students in a teacher-identified experimental group and 13 students in a control group. A pre-posttest comparison was made using the Wide Range Achievement Test and a locally prepared Student Evaluation Form. Both experimental groups showed greater gains on the achievement test, on grades and on the student evaluation form than the control group but these gains were not significant.

CHAPTER III

METHODS AND PROCEDURES

Northwest High School has open classrooms with a flexible rotating schedule. The Basic Mathematics program is a competency based program. A student is given a placement test at the beginning of the quarter. Each student works individually through an exercise package on a specific mathematics skill. When the student completes the package, the student takes a subtest on that skill. The student must answer 80 percent of each subtest correctly in order to advance to the next level. Six to eight teachers teach different basic mathematics operations; as the student advances the student changes from one teacher to another at their own rate. To receive credit for the course the student must achieve 70 percent accuracy on each of the subtests of the final examination. The placement test and the final examination are similar; both tests were developed by the mathematics department chairperson based on the SRA diagnostic test.

Northwest operates on a three quarter system with 60 teaching days to a quarter. This study was conducted Spring quarter. Ninety-six percent of the students involved had previously failed Basic Mathematics. A group of 75 ninth grade students were randomly selected from 135 ninth grade students registered for Basic Mathematics and assigned to three groups of 25 students each. These groups were: (I) peer tutoring group, (II) role modeling group, and (III) control group. The treatment took place during the regular mathematics class in order to control the time

factor. The mathematics class, due to the rotating schedule, met four times a week for a total of five hours a week, 60 days to a quarter.

The role models were selected from senior mathematics classes and scheduled to serve as role models during the Basic Mathematics class. The role model received a grade and five quarter hours of credit for working as a role model. No measurement was made of their achievement. The role models received training in reinforcing appropriate behavior. The role models worked with their group of five ninth grade students on mathematics individually. Role models were requested to divide their time equally among the five. On two occasions the role model and his/her group met in an open discussion group to discuss study techniques, need of mathematics ability and related topics. Role models went from one open area to another in order to aid their tutees to master the particular skill they were studying.

The peer tutor group received no special training in tutoring. They were allowed to work in pairs. Students decided informally which would be the tutor or tutee. No identification was made of which student served as a tutor or tutee in the tutoring group. The majority served as a tutor and a tutee at different times. Some of the lower achieving students served only as tutees. The structure of the Basic Mathematics Program did not allow for any single group of ninth graders to serve as tutors exclusively. When students first entered a new skill level, they were usually in need of tutoring; when students had mastered the concept, the act of tutoring helped to reinforce the concept. The findings of the peer tutor study are limited to the total effect of peer tutoring. No

information was collected on the single effect of serving as a tutor or tutee.

The classroom teacher was available to the control and experimental groups at all times. Conditions were held the same for all students except for the experimental treatments.

A pretest-posttest, control group design was used. The teacher-made mathematics achievement test and the counselor-made attitude scale were used for the pre and posttest comparisons. All three groups were administered the pretest and posttest mathematics achievement test and the self concept scale at the same time. The pretests were administered the first two days of the quarter. The posttests were administered the last two days of the quarter. Analyses of covariance were performed to test all hypotheses dealing with mean gains in mathematics and self concept for significance at the .05 level. Chi square tests were performed for each pair of groups to test for significant differences in the number of dropouts. A 2×3 chi square test was performed to test for significant differences in dropouts, at the .05 level, between all three groups. The mathematics test scores between the previous quarter and the experimental quarter were also compared for significant difference using an analysis of covariance of the mean gains.

CHAPTER IV

RESULTS

The first hypothesis stated that there would be no significant difference between the experimental groups and the control group on mathematics achievement. An analysis of covariance showed that this hypothesis was not rejected, $F(2, 61) = .12$. In Table 1 is a summary of an analysis of covariance on the data. Mean pre and posttest scores for the peer tutoring group were 4.66 and 6.05, respectively. Mean pre and posttest scores for the role modeling group were 4.79 and 6.31, respectively. Mean pre and posttest scores for the control group were 4.90 and 6.23, respectively.

The second hypothesis stated that there would be no significant difference between the experimental groups and the control group on the self concept scale. An analysis of covariance, which is summarized in Table 2, showed that this hypothesis was not rejected, $F(2, 61) = 1.51$. Mean pre and posttest scores for the peer tutoring group were 17.88 and 19.5, respectively. Mean pre and posttest scores for the role modeling group were 18.77 and 20.27, respectively. Mean pre and posttest scores for the control group were 19.84 and 19.89, respectively.

The third hypothesis stated that there would be no significant difference between the role modeling group and the control group's number of dropouts. A chi square test, as summarized in Table 3, showed that this hypothesis was not rejected, $\chi^2(1) = .66$. The chi square with Yates correction was used to test for significant difference in the

TABLE 1

ANALYSIS OF COVARIANCE OF MATHEMATICS ACHIEVEMENT SCORES FOR THE PEER TUTORING GROUP, THE ROLE MODELING GROUP, AND THE CONTROL GROUP

Source of Variation	SS	df	MS	F
Between	.30	2	.15	.12
Within	79.38	61	1.30	
Total	79.68	63		

TABLE 2

ANALYSIS OF COVARIANCE OF SELF CONCEPT SCORES FOR THE PEER TUTORING GROUP, THE ROLE MODELING GROUP, AND THE CONTROL GROUP

Source of Variation	SS	df	MS	F
Between	45.91	2	22.96	1.51
Within	929.31	61	15.23	
Total	975.22	63		

TABLE 3

2 × 2 CONTINGENCY TABLE FOR NUMBER OF DROPOUTS AND NONDROPOUTS
FOR THE ROLE MODELING GROUP AND THE CONTROL GROUP

	Dropouts	Nondropouts
Role Modeling Group	2	23
Control Group	5	20
Corrected χ^2 (1) = .66		

dropout rate among the groups. Yates correction was used because the expected frequency in two of the cells was less than five. No significant difference was found.

The fourth hypothesis stated that there would be no significant difference between the peer tutoring group and the control group's number of dropouts. A chi square test, as summarized in Table 4, showed that this hypothesis was not rejected, $\chi^2 (1) = 3.56$.

The fifth hypothesis stated that there would be no significant difference between the role modeling and peer tutoring groups' number of dropouts. A chi square test, as summarized in Table 5, showed that this hypothesis was not rejected, $\chi^2 (1) = .52$.

The sixth hypothesis stated that there would be no significant difference between the experimental groups and the control group's number of dropouts. A chi square 2×3 , as summarized in Table 6, indicated that this hypothesis should be rejected, $\chi^2 (2) = 6.00$. The chi square calculated value was 6.00 where as the critical value ($p < .05$) was 5.99.

An analysis of covariance was made on the gains in mathematics achievement from the previous quarter and the experimental quarter. The results, as summarized in Table 7, show that there was no significant difference in the gains made during the experimental quarter.

TABLE 4

2 × 2 CONTINGENCY TABLE FOR NUMBER OF DROPOUTS AND NONDROPOUTS
FOR THE PEER TUTORING GROUP AND THE CONTROL GROUP

	Dropouts	Nondropouts
Peer Tutoring Group	0	25
Control Group	5	20
Corrected χ^2 (1) = 3.56		

TABLE 5

2 × 2 CONTINGENCY TABLE FOR NUMBER OF DROPOUTS AND NONDROPOUTS
FOR THE PEER TUTORING GROUP AND THE ROLE MODELING GROUP

	Dropouts	Nondropouts
Peer Tutoring Group	0	25
Role Modeling Group	2	23
Corrected χ^2 (1) = .52		

TABLE 6

2 × 3 CONTINGENCY TABLE FOR THE NUMBER OF DROPOUTS AND NONDROPOUTS FOR THE PEER TUTORING GROUP, THE ROLE MODELING GROUP, AND THE CONTROL GROUP

	Dropouts	Nondropouts
Peer Tutoring Group	0	25
Role Modeling Group	2	23
Control Group	5	20
$\chi^2 (2) = 6.00, p < .05$		

TABLE 7

ANALYSIS OF COVARIANCE OF GAINS IN MATHEMATICS ACHIEVEMENT
BETWEEN PREVIOUS QUARTER AND EXPERIMENTAL QUARTER

Source of Variation	SS	df	MS	F
Between	.2	2	.1	.08
Within	77.49	59	1.31	
Total	77.69	62		

CHAPTER V

DISCUSSION

The analysis of covariance failed to reject all of the questions concerning mathematics achievement and self concept. All three groups made gains in mathematics achievement and self concept. However, the results indicate that role modeling and peer tutoring did not achieve a significant change in mathematics achievement or self concept as measured by the locally-made mathematics achievement test or the locally-made self concept scale. There is a possibility that these two instruments were not sensitive enough to show all changes. The teachers stated that one of the benefits of the two experimental treatments was it allowed them more time to work with other students. It was observed that the teachers gave more attention to the control students than the experimental groups, because the other two groups were already obtaining help from role models or peer tutors. This could possibly account for the fact that all three groups made progress and no significant difference occurred.

Caution should be used on the analysis of the results of the dropout rate. There was no significant difference between any two groups; so one cannot conclude that role modeling or peer tutoring was more effective in reducing the dropout rate. Caution should be used since the χ^2 was so close to the critical value. The dropout rate was 0 percent for the peer tutoring group, 8 percent for the role modeling group, and 20 percent for the control group. The increased attention received by the

experimental groups could account for the differences. More research is needed to identify what factor caused the difference in the dropout rate.

I. RECOMMENDATIONS

The mathematic teachers expressed a desire to incorporate the use of senior role models into the regular basic mathematics class. The teachers were not opposed to the use of peer tutors, but they preferred the role models. The preference could be due to the open classroom structure and the desire of the teachers to keep the noise level to a minimum. The structure of the Basic Mathematics program was more conducive to role modeling.

Peer tutoring and/or role modeling should be tried again starting in the Fall quarter. Many students' attitudes after two quarters of failure are negative. The two experimental groups did make greater gains than the control group. The role model group produced the greatest gains in mathematic achievement. The peer tutor group produced the greatest gains in the student's self concept. The peer tutor group failed to achieve a significant difference in the dropout rate by .28 of a point. The fact that the peer tutor, with no training, produced greater gains in self concept and a lower dropout rate raises a number of questions. Perhaps had the peer tutors received training there might have been significant differences. Further research is needed to investigate the difference between trained and untrained tutors. More research is needed to investigate the length and type of training that is more effective in training tutors. The reason that role models produced

higher mathematic achievement and the peer tutors produced higher self concept is unknown.

The experimental conditions were only in effect for 60 days, the use of role models and peer tutors should be tried over a full year. A standardized instrument with proven validity and reliability should be used to measure for changes in self concept. Data should be collected on the self concept and mathematic achievement effects of role modeling on the seniors. In order to measure for difference in the achievement of the group, the data from the peer tutors and peer tutees should be analyzed separately.

The two experimental groups compared to the control group did have a significant difference in dropout rate; with a dropout rate of 50 percent it would be a mistake not to investigate further.

REFERENCES

REFERENCES

- Adwere-Boamah, Joseph. Project MACK. Final Evaluation Report 1974-75. Oakland, Calif.: Oakland Unified School District, 1975. (ERIC Document Reproduction Service No. ED 140 415)
- Amster, Harriett. Effectiveness of Schell's Peer Teaching Program in Mathematics for Junior High School Students. Paper presented to American Education Research Association, Washington, D.C., 1975. (ERIC Document Reproduction Service No. ED 108 900)
- Anderson, Josie B. A Study of the Retention of Potential Dropouts of Rosenwald High School for 1959-60. Unpublished master's thesis, The University of Tennessee at Knoxville, 1964.
- Arkell, R. N. Are Student-Helpers Helped? Psychology in the Schools, 1975, 12, 113-115.
- Beasley, James. Paducah-Louisville Consortium, Project VIII. Washington, D.C.: Bureau of Elementary and Secondary Education, 1974. (ERIC Document Reproduction Service No. ED 114 448)
- Carlson, Richard T. An Investigation into the Effects Student Tutoring has on Self-Concept and Arithmetic Computation Achievement of Tutors and Tutees (Doctoral dissertation, Northern Illinois University, 1973). Dissertation Abstracts International, 1973, 34, 2265A. (University Microfilms No. 73-27, 585)
- Clarkson, David M. Children as Teachers—Some Fundamental Operations. The Arithmetic Teacher, 1975, 22, 495-497.
- Cox, W. L., and Gilmore, Candie. MAL—Math: A Working Model for Cross Age Teaching. School Science and Mathematics, 1976, 74, 517.
- Devin-Sheehan, Linda, Feldman, Robert S., and Allen, Vernon L. Research on Children Tutoring Children: A Critical Review. Review of Educational Research, 1976, 46, 355-385.
- Elliott, Arthur H. Turning It Around in Education with Student Tutoring. The Clearing House, 1977, 50, 285-290.
- Gartner, Alan, Kohler, Mary C., and Riessman, Frank. Children Teach Children, Learning by Teaching. New York: Harper and Row, 1971.
- Geer, Charles Paul. The Effects of Cross-Age Tutoring on the Achievement and Self-Concept of Low-Achieving Students (Doctoral dissertation, Arizona State University, 1977). Dissertation Abstracts International, 1977, 37, 5909A. (University Microfilms No. 7803425)

- Goodyear, Rodney K. A Review of Psychologically Oriented Interventions for Potential Dropouts. The Journal of Educational Research, 1974, 67, 347-350.
- Gowan, John Curtis, and Demos, George D. The Disadvantaged and Potential Dropout Compensatory Education Programs. Springfield, Ill.: Charles C. Thomas, 1966.
- Greene, Bert. Preventing Student Dropouts. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1966.
- Greenwood, Charles R., Sloane, Howard N., Jr., and Baskin, Arlene. Training Elementary Aged Peer-Behavior Managers to Control Small Group Programmed Mathematics. Journal of Applied Behavior Analysis, 1974, 7, 103-114.
- Harris, V. William, and Sherman, James A. Effects of Peer Tutoring and Consequences on the Math Performance of Elementary Classroom Students. Journal of Applied Behavior Analysis, 1973, 6, 587-597.
- Hassett, John J. Peer Tutoring in New York City High Schools. English Journal, 1974, 63(4), 77-78.
- Heintz, Paul. High School Peer Tutoring (Homework Helpers) Program: School Year, 1974-75. Brooklyn, N.Y.: New York City Board of Education, 1975. (ERIC Document Reproduction Service No. ED 137 451)
- Helwig, Carl, and Griffin, Shade. Ninth Graders Teach Arithmetic to Fifth Graders: An Experiment. School Science and Mathematics, 1974, 74, 13-15.
- Herzig, Shoshana. Junior High School Students as Teaching Aides. The Arithmetic Teacher, 1974, 21, 333-335.
- Horan, John J., De Girolomo, Mary Ann, Hill, Ronald L., and Shute, Robert E. The Effect of Older-Peer Participant Models on Deficient Academic Performance. Psychology in the Schools, 1974, 11, 207-212.
- Howell, Kenneth W. Using Peers in Drill-Type Instruction. The Journal of Experimental Education, 1978, 46(3), 52-56.
- Jackson, Vivian C., and Riessman, Frank. A Children Teaching Children Program. Theory Into Practice, 1977, 16, 280-284.
- Johnson, Martha, and Bailey, Jon S. Cross-Age Tutoring: Fifth Graders as Arithmetic Tutors for Kindergarten Children. Journal of Applied Behavior Analysis, 1974, 7, 223-232.

- Kane, Bruce J. The Comparison of Peer Tutor Implementors to LD Teacher Implementors, in Implementing a Computational Mathematics Program for Incarcerated Juvenile Delinquents Identified as Learning Disabled in Computational Mathematics Ability (Doctoral Dissertation, University of Kansas, 1976). Dissertation Abstracts International, 1977, 37, 5037A-5038A. (University Microfilms No. 77-2240)
- Kenemuth, Gail L. An Experimental Study of the Effects on Achievement and Self-Concept of Sixth Grade Pupils as a Result of Tutoring Younger Elementary Pupils in Selected Activities (Doctoral dissertation, The Pennsylvania State University, 1974). Dissertation Abstracts International, 1974, 35, 7043A-7044A. (University Microfilms No. 75-9793)
- Levine, Kenneth Paul. The Effect of an Elementary Mathematics Tutoring Program upon the Arithmetic Achievement, Attitude Toward Mathematics, and the Self-Concept of Fifth Grade Low Achievers When Placed in the Role of Student Tutors (Doctoral dissertation, Temple University, 1975). Dissertation Abstracts International, 1976, 37, 2039A. (University Microfilms No. 76-22, 053)
- Lobitz, W. Charles. Maximizing the High School Counselor's Effectiveness: The Use of Senior Tutors. The School Counselor, 1970, 18(2), 127-128.
- McCarty, Timothy, Griffin, Susan, Apolloni, Tony, and Shores, Richard E. Increased Peer-Teaching with Group-Oriented Contingencies for Arithmetic Performance in Behavior-Disordered Adolescents. Journal of Applied Behavior Analysis, 1977, 10, 313. (Abstract)
- Michael, Millard E. Students Helping Students. Industrial Technical Education, 1975, 34(6), 35.
- Morrissey, Patricia Anne. The Effects of Varied Tutoring Role Assignments on Multiplication Proficiency in Fourth Grade Children (Doctoral dissertation, The Pennsylvania State University, 1974). Dissertation Abstracts International, 1974, 35, 7130A-7131A. (University Microfilms No. 75-9813)
- Olsen, Turee. Students as Teachers. The Reading Teacher, 1974, 27, 506-508.
- Osguthorpe, Russell T., and Harrison, Grant V. The Effects of Pre-Remedial Instruction on Low Achievers' Math Skills and Classroom Participation. Reading Improvement, 1976, 13(3), 147-150.
- Roundtree, George Alexander. An Experimental Study of the Effects of a Mathematical Education Model on Self-Esteem of Male Prison Inmates (Doctoral dissertation, The Louisiana State University and Agricultural and Mechanical College, 1976). Dissertation Abstracts International, 1976, 37, 3345A. (University Microfilms No. 76-28, 826)

- Schmuck, Richard A. Peer Groups as Settings for Learning. Theory Into Practice, 1977, 16(4), 272-279.
- Siegleman, Marvin. Summer Mathematics Remediation for Incoming Pupils. Brooklyn, N.Y.: New York City Board of Education, 1975. (ERIC Document Reproduction Service No. ED 138 661)
- Smith, Clarence C., Jr. Partner Learning: Peer Tutoring Can Help Individualization. Educational Leadership, 1977, 34(5), 361-363.
- Tannenbaum, Abraham J. Dropout or Diploma. New York: Teachers College Press, 1966.
- Thornburg, Hershel D. Attitudinal Determinants in Holding Dropouts in School. The Journal of Educational Research, 1975, 68(5), 181-184.
- Vassallo, Wanda. Learning by Tutoring. American Education, 1973, 9(2), 25-28.
- Vriend, Thelma J. High-Performing Inner-City Adolescents Assist Low-Performing Peers in Counseling Groups. The Personnel and Guidance Journal, 1969, 47, 897-904.
- Wing, Charles J. The Effects of a "Youth Tutoring Youth" Program on Potential Dropouts (Doctoral dissertation, University of Wyoming, 1972). Dissertation Abstracts International, 1972, 33, 1452A. (University Microfilms No. 72-13, 257)
- Wu, Paul P. The Effects of a Peer Tutorial Program on Academic Achievement and Self Concept of Low Achieving High School Mathematics Students (Doctoral dissertation, The Florida State University, 1973). Dissertation Abstracts International, 1974, 34, 5612A-5613A. (University Microfilms No. 74-6607)
- Young, Jerry L. A Program to Identify Dropout-Prone Students, Assess Their Needs, and to Design an Individualized Instructional Program Appropriate for Meeting Such Needs. Washington, D.C.: Office of Education (DHEW), 1975. (ERIC Document Reproduction Service No. ED 112 332)
- Zeller, Robert. Lowering the Odds on Student Dropouts. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1966.

APPENDIXES

APPENDIX A

SELF CONCEPT SCALE

Please circle your answer.

Name _____

1. Most of the time I like to go to school. YES NO
2. Many times I give up because I don't understand something. YES NO
3. I can figure out things for myself. YES NO
4. When I am absent from school my classmates miss me. . . . YES NO
5. It is easy for me to make good grades. YES NO
6. When school work is hard, most of the time I give up. . . YES NO
7. Most of the time I understand a story the first time I read it. YES NO
8. Problems are easy for me to solve. YES NO
9. If I don't understand I will ask the teacher to explain again. YES NO
10. I often do things without thinking. YES NO
11. I try to play fair with my classmates. YES NO
12. A lot of my best friends are in this class. YES NO
13. I don't like to start work on new things. YES NO
14. I get scared when I'm called on in class. YES NO
15. I usually know the answer before the rest of the class. YES NO
16. When I'm doing things wrong I try to change. YES NO
17. I feel left out of things in class. YES NO

- | | | | |
|-----|---|-----|----|
| 18. | I make good grades on tests. | YES | NO |
| 19. | It is easy for me to get up in front of the class to
speak. | YES | NO |
| 20. | I find it hard to talk to classmates. | YES | NO |
| 21. | It is important to me to do well in my school work. . . . | YES | NO |
| 22. | I sometimes copy from my friends. | YES | NO |
| 23. | I am an important person to my classmates. | YES | NO |
| 24. | I don't have any trouble learning. | YES | NO |
| 25. | My work is done on time. | YES | NO |
| 26. | I feel good about my school work. | YES | NO |
| 27. | My classmates like me. | YES | NO |
| 28. | I do my school work without being told more than
once. | YES | NO |
| 29. | Many times I forget what the teacher told us to do
next. | YES | NO |
| 30. | I like the kids in this class very much. | YES | NO |
| 31. | I try to be careful about my work. | YES | NO |
| 32. | I find it easy to get along with my classmates. | YES | NO |
| 33. | Most kids are smarter than me. | YES | NO |
| 34. | Most of the time I don't understand what is going on
in class. | YES | NO |
| 35. | It is hard for me to remember things. | YES | NO |
| 36. | I make mistakes because I didn't listen carefully. . . . | YES | NO |

APPENDIX B

Name _____

Test on Whole Numbers

Show all work on this test paper.

Addition

- | | | | | | | |
|---|--|---|---|---|---|---|
| 1. $\begin{array}{r} 54 \\ +29 \\ \hline \end{array}$ | 2. $\begin{array}{r} 6 \\ 7 \\ +4 \\ \hline \end{array}$ | 3. $\begin{array}{r} 24 \\ 23 \\ +12 \\ \hline \end{array}$ | 4. $\begin{array}{r} 13 \\ 22 \\ +57 \\ \hline \end{array}$ | 5. $\begin{array}{r} 9 \\ 8 \\ 7 \\ +5 \\ \hline \end{array}$ | 6. $\begin{array}{r} 31 \\ 57 \\ 24 \\ 86 \\ +92 \\ \hline \end{array}$ | 7. $\begin{array}{r} 249 \\ +763 \\ \hline \end{array}$ |
|---|--|---|---|---|---|---|
-
- | | | |
|---|---|---------------------------------|
| 8. $\begin{array}{r} 4279 \\ 4357 \\ +8342 \\ \hline \end{array}$ | 9. $\begin{array}{r} 13,631 \\ 20,536 \\ 35,042 \\ 27,345 \\ +84,793 \\ \hline \end{array}$ | 10. $2,463 + 127 + 34 + 20,345$ |
|---|---|---------------------------------|

Subtraction

- | | | | | | |
|---|---|---|---|---|---|
| 1. $\begin{array}{r} 84 \\ -32 \\ \hline \end{array}$ | 2. $\begin{array}{r} 91 \\ -27 \\ \hline \end{array}$ | 3. $\begin{array}{r} 282 \\ -132 \\ \hline \end{array}$ | 4. $\begin{array}{r} 80 \\ -24 \\ \hline \end{array}$ | 5. $\begin{array}{r} 724 \\ -346 \\ \hline \end{array}$ | 6. $\begin{array}{r} 9000 \\ -1347 \\ \hline \end{array}$ |
|---|---|---|---|---|---|
-
- | | | | |
|--|---|---|--|
| 7. $\begin{array}{r} 946 \\ -57 \\ \hline \end{array}$ | 8. $\begin{array}{r} 704 \\ -230 \\ \hline \end{array}$ | 9. $\begin{array}{r} 6243 \\ -5057 \\ \hline \end{array}$ | 10. $\begin{array}{r} 63,407 \\ -20,428 \\ \hline \end{array}$ |
|--|---|---|--|

Multiplication

- | | | | | | |
|--|---|---|--|--|---|
| 1. $\begin{array}{r} 39 \\ \times 5 \\ \hline \end{array}$ | 2. $\begin{array}{r} 324 \\ \times 8 \\ \hline \end{array}$ | 3. $\begin{array}{r} 86 \\ \times 23 \\ \hline \end{array}$ | 4. $\begin{array}{r} 2473 \\ \times 256 \\ \hline \end{array}$ | 5. $\begin{array}{r} 800 \\ \times 50 \\ \hline \end{array}$ | 6. $\begin{array}{r} 5003 \\ \times 46 \\ \hline \end{array}$ |
|--|---|---|--|--|---|
-
- | | | | |
|---|---|--|--|
| 7. $\begin{array}{r} 603 \\ \times 280 \\ \hline \end{array}$ | 8. $\begin{array}{r} 507 \\ \times 370 \\ \hline \end{array}$ | 9. $\begin{array}{r} 900 \\ \times 28 \\ \hline \end{array}$ | 10. $\begin{array}{r} 2090 \\ \times 69 \\ \hline \end{array}$ |
|---|---|--|--|

Division

1. $9/\overline{261}$ 2. $44/\overline{1496}$ 3. $23/\overline{384}$ 4. $21/\overline{5250}$

5. $25/\overline{975}$ 6. $26/\overline{10530}$ 7. $36/\overline{8524}$ 8. $46/\overline{24196}$

9. $546/\overline{15834}$ 10. $324/\overline{50007}$

Name _____

Test on Decimals

Show all work on this test paper

Addition

- 1) $\begin{array}{r} .2 \\ .5 \\ +.2 \\ \hline \end{array}$ 2) $\begin{array}{r} 5.4 \\ 2.5 \\ +1.8 \\ \hline \end{array}$ 3) $.4 + .8 + .6$ 4) $62.5 + 3.04$ 5) $25 + 2.4 + .23$
- 6) $15.23 + 2.1 + 5.607$ 7) $.8 + 20.5 + 300.2$ 8) $10.3 + 7 + .8$
- 9) $362.1 + 2.473 + 1.2 + .034$ 10) $.00977 + .000491$

Subtraction

- 1) $\begin{array}{r} .9 \\ -.5 \\ \hline \end{array}$ 2) $\begin{array}{r} 9.03 \\ -4.73 \\ \hline \end{array}$ 3) $\begin{array}{r} 15.2 \\ -7.05 \\ \hline \end{array}$ 4) $\begin{array}{r} 23.04 \\ -7.6 \\ \hline \end{array}$ 5) $.936 - .24$
- 6) $6.48 - .93$ 7) $27 - 2.7$ 8) $203.1 - .231$ 9) $503.2 - 5.032$
- 10) $620 - .007$

Multiplication

- 1) $.5 \times 4$ 2) $.32 \times .14$ 3) $36.2 \times .64$ 4) $.347 \times 100$ 5) 8.92×1000
- 6) $500 \times .3$ 7) $7.24 \times .001$ 8) $.03 \times 1.7$ 9) $.15 \times .15$ 10) $\begin{array}{r} 87.5 \\ \times 64.8 \\ \hline \end{array}$

Division

- 1) $13/\overline{6.5}$ 2) $7/\overline{.0056}$ 3) $4/\overline{2}$ 4) $6 \div 1000$ 5) $9 \div .001$ 6) $24/\overline{63.12}$
- 7) $9.8/\overline{4.606}$ 8) $5.47/\overline{175.04}$ 9) $.253/\overline{.17204}$ 10) $.25/\overline{2.0575}$

Name _____

Test on Fractions

Show all work on this test paper. Reduce and change answers to mixed numbers if possible.

Addition

$$\begin{array}{r} 1. \quad \frac{3}{5} \\ + \frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 2. \quad \frac{2}{5} \\ + \frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 3. \quad \frac{2}{3} \\ + \frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 4. \quad \frac{4}{7} \\ + \frac{3}{7} \\ \hline \end{array} \quad \begin{array}{r} 5. \quad \frac{4}{5} \\ + \frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 6. \quad \frac{5}{8} \\ + \frac{5}{12} \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 7\frac{1}{9} \\ + 3\frac{1}{9} \\ \hline \end{array} \quad \begin{array}{r} 8. \quad 6\frac{7}{10} \\ + 15\frac{7}{10} \\ \hline \end{array} \quad \begin{array}{r} 9. \quad 15\frac{3}{7} \\ + 62\frac{8}{9} \\ \hline \end{array} \quad \begin{array}{r} 10. \quad \frac{7}{9} \\ + \frac{1}{6} \\ \hline \end{array}$$

Subtraction

$$\begin{array}{r} 1. \quad \frac{8}{9} \\ - \frac{2}{9} \\ \hline \end{array} \quad \begin{array}{r} 2. \quad \frac{7}{16} \\ - \frac{5}{16} \\ \hline \end{array} \quad \begin{array}{r} 3. \quad \frac{7}{9} \\ - \frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 4. \quad \frac{7}{2} \\ - \frac{1}{6} \\ \hline \end{array} \quad \begin{array}{r} 5. \quad 7\frac{1}{11} \\ - 5 \\ \hline \end{array} \quad \begin{array}{r} 6. \quad 20\frac{7}{10} \\ - 6\frac{1}{9} \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 14 \\ - 5\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 8. \quad 24\frac{1}{3} \\ - 7\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 9. \quad 32\frac{1}{10} \\ - 17\frac{5}{15} \\ \hline \end{array} \quad \begin{array}{r} 10. \quad 6\frac{7}{12} \\ - 4\frac{1}{3} \\ \hline \end{array}$$

Multiplications

$$\begin{array}{l} 1. \quad \frac{1}{4} \times \frac{1}{7} \quad 2. \quad \frac{4}{5} \times \frac{6}{7} \quad 3. \quad \frac{5}{12} \times \frac{4}{21} \quad 4. \quad 8 \times \frac{5}{8} \quad 5. \quad 2\frac{1}{3} \times \frac{1}{4} \\ 6. \quad \frac{1}{6} \times \frac{1}{5} \times 3\frac{1}{8} \quad 7. \quad \frac{8}{9} \times \frac{2}{5} \times \frac{5}{6} \quad 8. \quad \frac{36}{1} \times 4\frac{1}{6} \quad 9. \quad \frac{15}{1} \times 3\frac{1}{4} \quad 10. \quad \frac{5}{10} \times \frac{1}{3} \times \frac{4}{6} \end{array}$$

Division

$$\begin{array}{l} 1. \quad \frac{7}{9} \div \frac{1}{3} \quad 2. \quad \frac{3}{8} \div \frac{5}{16} \quad 3. \quad \frac{7}{10} \div \frac{3}{10} \quad 4. \quad \frac{22}{25} \div \frac{5}{15} \quad 5. \quad 7 \div \frac{7}{10} \quad 6. \quad \frac{11}{12} \div 4 \\ 7. \quad \frac{1}{4} \div 3\frac{5}{8} \quad 8. \quad 3\frac{2}{3} \div \frac{1}{6} \quad 9. \quad 3 \div \frac{6}{7} \quad 10. \quad 2\frac{1}{7} \div 2\frac{1}{3} \end{array}$$

VITA

Wayne Edward Finnell was born in Cleveland, Tennessee on October 17, 1946. He attended elementary schools in the Bradley County school system and the Cleveland City System. He graduated from Bradley Central High School in May, 1965. In August, 1969 he received a Bachelor of Science degree in Social Science from East Tennessee State University. In the fall of 1969, he accepted a teaching position in the Fanin County School System in Blue Ridge, Georgia. Since then he has been employed as a teacher in the Hart County School System in Hartwell, Georgia; the Bradley County School System in Cleveland, Tennessee; and is presently employed as a guidance counselor in the Whitfield County School System in Dalton, Georgia.

He entered The University of Tennessee at Chattanooga in the spring of 1972 and began study toward a Master's degree. This degree in School Administration and Supervision was awarded in May, 1974. He entered The University of Tennessee at Knoxville in the spring of 1976 to study toward a Specialist in Education degree, with a major in Educational Psychology and Guidance. He received this degree in August, 1979.

The author is a member of Pi Lambda Theta, National Education Association, Georgia Association of Educators, Whitfield County Education Association, and the American Personnel and Guidance Association.

He is married to the former Linda Pippin of Bonifay, Florida and they have two children.