A LONGITUDINAL STUDY OF RACIAL AND GENDER EQUITY IN MATHEMATICS ACHIEVEMENT OF SEVENTH GRADE STUDENTS

FAYE P. TAYLOR

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I am submitting herewith a field study written by Faye P. Taylor entitled, " A Longitudinal Study of Racial and Gender Equity in Mathematics Achievement of Seventh Grade Students." I have examined the final copy of this paper for form and content, and I recommend that it be accepted in partial fulfillment of the requirements for the degree of Educational Specialist, with a major in Administration and Supervision.

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A Field Study
Presented to
the Graduate Council of
Austin Peay State University

In Partial Fulfillment
of the Requirements for the Degree
Educational Specialist

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by Faye P. Taylor
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ABSTRACT

The mathematics achievement scores of a group of students were compared over a period of three years to determine if there were differences in the achievement of racial and gender groups.

Descriptive data were compiled and charted to identify differences in achievement level and achievement gains. Mean and median national percentiles and national quartiles were compared.

Results suggest the existence of disparity in achievement between racial groups and are inconclusive regarding disparity in achievement gains. Results suggest that both the achievement levels and the achievement gains for these students were greater in the area of mathematics computation than in the area of mathematics concepts and application. The results indicate that the scores of the Caucasian students in the study more closely reflected the normal distribution across national quartiles than did the scores of the African American students in the study.

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CHAPTER 1

Introduction

As the nation enters the new millennium, educational researchers are called upon to evaluate the degree to which the educational system of the United States has met the goals for the year 2000 as established in *The National Education Goals Report: Building A Nation of Learners* (1991). Paramount in the quest for a world-class educational system is the goal that "... every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy" (The National Education Goals Panel, 1993). Inherent in this goal is the belief that all children can achieve at higher levels and that the distribution of students' scores; regardless of gender, race, socio-economics, language, or ethnicity, should reflect the normal distribution of scores of the population as a whole (The National Education Goals Panel, 1993).

Historically, disparity has been found in the performance of ethnic and gender groups of students on standardized assessments, and there exists considerable debate among researchers as to whether any progress has been made toward closing achievement gaps. Reports based upon analyses of data from the National Assessment of Education Progress (NAEP) cite improvement in all racial-ethnic groups and at all grade levels between 1973 and 1992 and conclude that the achievement gap is indeed closing as a result of greater gains among African American and Hispanic students than among White students (Tate, 1997).

Other researchers find evidence to be less conclusive and report that the gap is narrowing only for African Americans on items requiring mastery of low-level and basic skills (Secada, 1992). While causes for such disparity have yet to be conclusively identified, it is evident that bridging the achievement gap between Whites and minorities is one of the greatest challenges facing schools and school systems as they seek to meet the educational goals established for the new millennium.

Another concern regarding achievement disparity is the gap which has been found to exist between the achievement levels of males and females, especially in the areas of science and mathematics. Gender gaps in achievement have generally been found not to exist in the early grades but to emerge in middle or high schools and to impact significantly the course selections and occupational choices of females. Surprisingly, studies regarding gender differences within races are rarer than studies specific to gender or race.

The first step in addressing the challenges of educational reform and in evaluating the effectiveness of improvement efforts is to establish a clear understanding of the progress which has been made in narrowing the achievement gap within individual schools and school systems across the nation. The state of Tennessee has made a considerable investment in the provision of assessment instruments to collect student performance data. These assessments collectively are known as the Tennessee Comprehensive Assessment Program (TCAP). One specific TCAP test is the achievement test developed by CTB/McGraw Hill which is administered each spring to students in grades three through eight.

Mandated by the Tennessee General Assembly through the *Education Improvement Act of 1992*, the state adopted a model for data analysis developed by Dr. William Sanders of the University of Tennessee to determine the progress of students and the extent to which schools and teachers contribute to that progress (Bock, Wolfe, & Fisher, 1996). This model is known as the Tennessee Value-Added Assessment System (TVAAS) and is the backbone of Tennessee's accountability report, the *21st Century Report Card,* which is published for each school system annually. Reports of school and system progress based upon TVAAS data are provided to local school systems annually by the Department of Education. These reports provide valuable information regarding the overall achievement gains of students within a system or school. Systemwide student data and data specific to each school is available from the state on computer disks. These data can be disaggregated in order to study performance trends and to identify disparities among schools and groups of students. Instructional supervisors in most school systems do not have the time and training needed to extract the data and to do the statistical procedures needed for the scientific analyses of these data.

The true litmus test of the improvement of a school system is not its relative standing among other systems in the state and nation but the improvement of its students' performance over time (Sanders, 1993). According to Tennessee Code Annotated "The goal is for all school districts to have mean gain for each measurable academic subject within each grade greater than or equal to the gain of the national norms" (TCA 49-1-601). The TVAAS model is based upon the premise that educational effectiveness should be judged, not by the score a student makes on a single test, but by the amount of gain the student makes from year to year (Bratton, 1996). By emphasizing the amount of gain made, rather than the performance level of students, those factors which have been determined to influence achievement levels within systems, i.e., racial composition and socioeconomic levels, can be minimized. Three-year analyses of TVAAS data have shown conclusively that racial composition is not a reliable predictor of achievement gains of a school or school system (Bratton, 1996). The TVAAS developers have concluded that all students, regardless of current level of achievement or other factors, can make equal achievement gains if they have appropriate instruction (Sanders & Horn, 1994). Systems which are serious in their efforts to improve the education of all students must look closely at the achievement gains of typically underserved and underachieving students as they make decisions regarding the effectiveness of past efforts and the direction of future endeavors.

The median national percentile scores of Robertson County students on the TCAP achievement test have historically been slightly above the national average and almost identical to the state's scores in every subject area and at every grade level, including mathematics which tends to be consistently the lowest area of achievement. Data indicate that the average percentile for each grade level two through eight has remained relatively stable over the last four years, with average percentiles in 1998 ranging from 62 in grade 2 to 53 in grade 5 (*21st Century Report Card*, 1998). In 1997-98, median national percentiles in mathematics ranged from the 52nd percentile in fifth and seventh grades to the 56th percentile in fourth grade. Three-year average achievement gains during the period 1996-1998 in mathematics were not significantly different than those of the national norm gain at 98.3% (*21st Century Report Card*, 1998).

The average median national percentile for eighth grade students in Robertson County in 1998 was 55, an improvement of 5 percentile points when compared to eighth grade students in 1991-92 but 8 percentile points below the average median national percentile of 63 for this same group as seventh graders. These students constitute the population from which the sample for this study was derived.

The purpose of this study was to examine the three-year achievement data in mathematics of the students in the county who were seventh graders in 1997 (a) to determine the level of disparity among the performance scores of students when data were disaggregated by race and gender, and (b) to analyze the achievement gains of each group to determine if students made equal gains in achievement.

Three years of archival data (95-96-97) from the Tennessee Comprehensive Assessment Program achievement test were complied and charted for all county students who were seventh graders in 1996-97. This three-year period was selected because of a change in the form of the achievement test in 1998. The median national percentiles and the normal curve equivalences for both subtests of mathematics were charted and compared for each of four groups; White males, Black males, White females, and Black females to determine if achievement disparity were evident among the groups.

The mean and median scale scores for the three-year period were charted for each group to determine achievement gains. The cumulative gains of all groups were then compared to determine if there was disparity among students' gains during this period.

Statement of the Problem

Studies have historically identified disparity between the performance scores on standardized achievement tests of Whites and minorities, especially in mathematics. Although several factors have been found to have a significant impact upon the performance of minority students, no conclusive results have provided direction to educators in order to reduce the disparity. Yet, national reform efforts and national education goals call for a narrowing of the achievement gap between Whites and minorities and for a distribution of achievement scores for minority students which more closely approximates the distribution of scores for the population as a whole (National Education Goals Panel, 1993). Local boards of education and community leaders faced with funding educational reform demand results as evidenced by improved test score performance. Schools and school systems desiring to make significant improvements in their educational programs are frustrated by their apparent powerlessness, both to understand why the disparity exists in test scores and to impact significantly the influence of this phenomenon.

Importance of the Problem

The United States is a significant part of a global marketplace which requires its participants to possess mathematical skills and understanding far beyond the basic computational skills of a 20th century education. During the 20th century, Caucasians represented the overwhelming majority of the population in the United States; however, the 21st century is anticipated to see significant changes in the makeup of the population of the country (Riche & Pollard, 1992). In order to continue to improve the present economic status of the United States and ensure a bright future, all Americans must be equipped with the skills and knowledge to live successful, productive lives in the new millennium.

Relationship of the Study to this Problem

Disparity in achievement among racial and gender groups contributes significantly to poor overall achievement levels of students in mathematics nationwide. In order to close the gap in performance on standardized tests between White and minority students, one trend must be evident: Minority students must make achievement gains annually which equal or exceed those of their White counterparts. To determine the efficacy of schools in reducing disparity, researchers must analyze both the performance levels and the achievement gains of groups of students.

A descriptive study based upon observational data was conducted to compare, not only the achievement levels of four groups of students: White males, Black males, White females, and Black females, but also to compare the achievement gains of these students over a three-year period of time. Findings from this study will help educators in Robertson County to evaluate the effectiveness of their mathematics program in producing equitable achievement gains among all students.

Preview

This descriptive study involves the collection, compilation, and analysis of systemwide archival data using the *TESTMATE* computer program developed by CTB/McGraw Hill. Data were disaggregated according to race and gender and only group data were used in the study. Data were obtained from all students in Robertson County who were seventh graders in 1997 and who took the TCAP achievement test in grades five, six, and seven. The fifth, sixth, and seventh grade mean and median national percentile scores and scale scores for mathematics computation and mathematics concepts and application were generated for each group: White males, Black males, White females, and Black females. Three years of scores were compared in order to increase the validity and reliability of the study.

Research Questions

The problems to be investigated will be guided by the following questions:

(1) Is there a discrepancy in the achievement levels in mathematics among male and female, White and minority students in Robertson County?

(2) Are all groups of students achieving at the same rate?

(3) Is there a difference in the achievement levels and gains of students in mathematics computation as compared to mathematics concepts and application?

Hypotheses

Hypothesis I: There will be no difference found in the achievement levels among the four subject groups: White males, Black males, White females, and Black females in the areas of mathematics computation and mathematics concepts and application.

Hypothesis II: There will be no difference found in the cumulative achievement gains among the four subject groups: White males, Black males, White females, and Black females in the areas of mathematics computation and mathematics concepts and application.

<u>Hypothesis III:</u> There will be no difference found within any group between the cumulative gains in the area of mathematics computation and the area of mathematics concepts and application.

<u>Hypothesis IV:</u> The percentage of students from each of the subject groups; White males, Black males, White females, and Black females found in each national quartile will approximate the normal distribution of the national population as a whole in mathematics computation and mathematics concepts and application.

Assumptions

The following assumptions were used during the study:

1. Since only those students who took the test in all three years were included in the sample, the groups of students from which the scores were obtained were adequately stable over the three-year period to assure validity and reliability of the sample.

2. The scores on the Tennessee Comprehensive Assessment Program achievement tests are true reflections of students' ability, and discrepancies in scores represent true discrepancies in academic achievement.

3. Student gains as determined by increased scale scores represent accurate measurements of students' achievement gains and are reliable indicators of students' progress or lack thereof.

De-limitations

This study is limited to students who were in the seventh grade in Robertson County in 1996-97 and who identified themselves as either White or Black on test demographics. Students who identified themselves as other minorities were excluded from the study.

Limitations

The scope of this study is limited to information regarding the level of performance and the gains of a group of seventh grade students in Robertson County. Although data from the total population of White and Black students were extracted, some students' scores were eliminated on the computer program due to inaccurate coding of ethnicity on the demographic portion of the test booklet or due to the absence of scores for one or more years. Therefore, the stability of the sample population selected was not affected by student transfers, retentions, and absentees. The size of the sample and the use of three years of data provided increased validity of the results.

Definition of Terms

1. Black: African American race.
2. Disparity: The degree of difference or inequality between standardized achievement test scores.
3. Ethnic/ethnicity: Distinctive of a particular race, culture, or language.
4. Gender: Sex

5. Mean Scale Score: "These are the numbers that correspond to the 50th percentile (nationally)" (Bratton, 1996, p.7).

6. Mean Scale Score Gains: "The numbers that represent the scale score points required to maintain the same percentile rank when moving from the end of one grade to the end of the next grade" (Bratton, 1996, p. 7).

7. Median National Percentile: The national percentile which corresponds with the middle score in an array.

8. Minority: Students other than Caucasian.

9. National Norm Gain: The amount of gain from year to year by the national sample.

10. Race/racial: Any group of people having common characteristics, habits, appearance, etc. For the purpose of this study, race will refer to African American and Caucasian or Black and White.

11. Socio-economics: The level of affluence of a student or group as a whole. In the school setting, socio-economic level is most often determined by the percentage of students qualifying for free or reduced lunches under the School Nutrition Program guidelines.

12. Value-added Assessment: " A statistical system for educational outcome assessment which uses measures of student learning to enable the estimation of teacher, school, and school district statistical distributions..." (TCA 49-1-603).

13. White: The Caucasian race.

Summary

Racial/ethnic and gender disparity in mathematics is a critical issue in the educational improvement efforts in the United States. National goals have been established for the 21st century which include reducing the achievement disparity among students and producing a score distribution for all student groups which more closely approximates the distribution of the population as a whole.

The Tennessee General Assembly, through the collective use of the Tennessee Comprehensive Assessment System and the Tennessee Value-Added Assessment System, has provided a mechanism to evaluate the degree to which local school systems are meeting Tennessee's educational improvement goals. All school systems are charged with using the wealth of data available to conduct ongoing studies to analyze the progress of individuals and groups of students, to address achievement gaps which exist among students, and to have achievement gains which equal or exceed national norm gains.

This study was designed to examine longitudinal data to determine if there is evidence of racial or gender disparity within a group of students in Robertson County, to compare the achievement gains among four groups of students to determine if groups are making equitable gains, and to examine the distribution of students in each group across national quartiles to determine if the distribution in Robertson County approximates the normal distribution.

CHAPTER 2

Review of Literature

Introduction

National studies of the 1970s and 1980s consistently reported the underachievement in mathematics of American students and resulted in numerous publications which foretold a decline in the world prominence of the United States, and stated that Americans' lack of competence in mathematics had made the nation especially vulnerable in a technological, global economic society. In 1983, *A Nation at Risk* proclaimed the vulnerability of the United States' world prominence due to the inadequacy of its education system to prepare its students to compete with students of other nations and issued a call for educational reform in the United States. A prominent concern was the need for increased proficiency in science and mathematics. In 1989, an education summit in Charlottesville, Virginia resulted in the *National Education Goals*, which established significant challenges in mathematics for the year 2000 (National Education Goals Report, 1991). At the same time, the National Council of Teachers of Mathematics (NCTM) established *Curriculum and Evaluative Standards* aimed at making substantive changes in mathematics education which would result in improved and more equitable achievement among all of America's students. The council concluded that mathematics competency had become "... a critical filter for employment and full participation in our society" (NCTM, 1989, p. 4).

In 1991, the *National Education Goals* challenged United States students to be "... first in the world in science and mathematics achievement ..." by the beginning of the new millennium (National Education Goals Report, 1993).

By 1996, it appeared that American students were indeed answering the challenge to improve their competence in mathematics. All groups of students were posting gains in mathematics as measured by achievement tests, were taking more challenging mathematics courses, had raised their educational aspirations, and had increased their enrollment in college mathematics courses. However, the disparity which had historically existed between the mathematics achievement of White and minorities had decreased only slightly (U.S. Department of Education, 1996).

Some of the most widely researched issues in education are those which deal with student achievement and the factors which lead to extreme variance in performance as measured by standardized achievement tests. No more perplexing issues exist than those related to racial/ethnic disparity. Studies focused on evaluating the American educational system's success in bridging the gap between the achievement levels of White and Black students have proliferated within research journals since the 1954 Brown vs. Board of Education decision affirmed that segregated schools contributed to the achievement gap between African Americans and Caucasians. (Walker & McCoy, 1997).

Considerable discussion has also been given to the issue of gender equity, especially in the areas of science and mathematics; however, limited attention has been given to the issue of disparity between the genders within racial groups.

This review of the literature includes an investigation of (a) the historical perspective of racial and gender disparity in mathematics achievement, (b) recent findings regarding the status of the achievement gap in mathematics by race and gender, (c) factors relating to racial and gender disparity, and (d) findings related to the effectiveness of educational initiatives and policies in improving the achievement of students in various racial and gender groups.

Historical Perspective

Ethnic disparity in achievement has been investigated for decades and from those investigations have emanated theories of both causal factors and appropriate interventions to rectify the inequities. Lansa and Potter (1984) describe the development of causal theories from the early 1950s to the early 1980's beginning with the Environmental Theory from which subsequent variations have evolved. Those who subscribe to the Environmental Theory were divided into two groups: those assigned responsibility for achievement disparity to the school and those who assigned responsibility to the home and family. Those who believed school-related factors contributed most significantly to the problem proposed that the integration of schools would create a more culturally stimulating and equitable learning environment for all students. This belief prompted the Brown vs Topeka decision of 1954 which belied the theory of separate but equal schools and resulted in the busing of students to integrate schools and assure equitable learning environments.

In the 1960s the theory of Cultural Deprivation was based upon the Piagetian theory that lack of appropriate stimulation in the early years resulted in a weak framework for future learning. This theory, a derivation of the Environmental Theory, supported the earlier hypothesis that home and family issues were predominant factors in student achievement. The nation responded to a call for compensatory programs to enrich the learning opportunities for students whose homes failed to provide adequate stimulation in the early years to develop the intellectual skills needed for school success. Lansa and Potter (1984) contended that compensatory programs engendered by the *Elementary and Secondary Education Act of 1965* were in response to the Cultural Deprivation movement.

The findings of Coleman et al., (1966) continued to support those who insisted that the home and family were the most influential factors in school achievement. Coleman disputed the idea that compensatory education programs were likely to produce significant improvement in achievement disparity since such interventions could not remediate innate differences.

Lansa and Potter (1984) identified the Genetic Theory proposed by Jensen (1969) as the next significant causative theory to emerge. Jensen's work concluded that the achievement disparity between Whites and Blacks was the result of genetic factors resulting in superior average intelligence of the White subjects. Consequently, Jensen dismissed earlier interventions as ineffective and unlikely to produce the desired result of reducing the achievement gap.

More recent research disputes the Genetic Theory but finds that despite equal innate intelligence and basic ability to understand mathematical concepts and processes (Stiff & Harvey, 1988) from about the age of nine, the level of achievement of Black students has consistently over time measured significantly below that of their White counterparts (Oakes, 1988; Secada, 1992).

With the 1970s came the emergence of the Cultural Difference theory which identified the need for school climates which recognized and reflected cultural diversity of students. Without assigning responsibility for lack of achievement, the Cultural Difference theory sought to improve the effectiveness of the interaction between home and school in order to advance the achievement of minority students (Lansa & Potter, 1984).

During the 1980s and 1990s, the Effective Schools research (Edmonds, 1979; Lezotte, 1989) enumerated school, classroom, and teacher factors which were found to have an impact on student achievement. The issues surrounding classroom environment and teacher effectiveness have formed the basis for numerous research models testing the degree to which schools contribute to student achievement in general and ethnic disparity more specifically. In addition, studies investigating previously identified causal factors such as socio-economic status, family composition, innate intelligence and ability to learn, motivation, student aspiration, and parental expectations continue to permeate the literature.

Sizemore (1990), in his own historical perspective, categorized theories relating to the achievement gap similarly to those identified in Lansa and Potter. Three theories dispeled the Effective Schools research and focused on factors relating to genetics, cultural deprivation, and familial inadequacies, while two other categories focused on school and societal issues.

Adams and Singh (1998) used a non-experimental, multi-equation design to investigate factors which were hypothesized to have direct or indirect effects on academic achievement of African American tenth grade students. Data from 1,766 students who were 8th graders in 1988 and 10th graders in 1990 and who completed NELS surveys in 1988 and 1990 were used to determine the relationship among eight endogenous variables; prior achievement of students, students' perceptions of the school environment, students' perceptions of teachers and teaching, parental aspirations for students, parental involvement, student aspirations, student motivation, and achievement and the two exogenous variables of gender and socio-economic status. The researchers found "... socioeconomic status, prior academic achievement, and students' perceptions of teachers and teaching quality ... to have significant effects on achievement" (p. 48). The factor identified by this study as having the greatest impact on the achievement of African American students was their previous level of academic achievement indicating that "... patterns of achievement are crystallized during earlier schooling ... " (p. 62).

Adams and Singh found a "... significant path ... to exist between students' perceptions of teachers and teaching and their achievement" (p. 58). Citing the work of Clark (1991), Cool and Keith (1991), Keith and Benson (1992), and Keith and Cool (1988), Adams and Singh explained teacher effect and its impact on achievement. "A significant teacher effect means that when students perceive teachers as caring about them and as giving them praise for their efforts, and when they perceive the quality of instruction as good, students are likely to be high achievers" (p. 58).

The results of this study are compelling not only because of the direct relationships found but also because of the lack of significant effect found in areas often suggested as causal factors of underachievement, such as parental expectations and the level of parental involvement. The study found that neither parental aspirations for their children nor parents' level of involvement had a significant effect on their subjects' achievement. Likewise, neither the students'

Oaspirations nor their level of motivation were found to have a significant effect after controlling for other variables.

Kohr et al., (1989) used longitudinal data from grades five, eight, and eleven from the Pennsylvania Educational Quality Assessment Program to study achievement differences by race and socio-economic status. Not surprisingly, differences were found for race and socio-economic status across the grade levels with White students consistently scoring higher than Black students. This study was able to control the variables sufficiently to conclude that the observed differences by race were not confounded by socio-economic factors. Neither were the differences found in socio-economic groups confounded by race.

Donna Ford (1993) conducted a study to determine the importance of family values on the achievement of Black students and found such variables as parents' level of education, occupation, employment status, and family composition, including the presence or absence of a father, had little impact on achievement of adolescents. The study did find, however, that Black students who perceived that their families believed school and gifted programs to be important were more positive toward school and achievement. Lareau (1987) concluded that children of well-educated and economically successful parents do better in school because their parents are more likely to know what schools expect and are better able to help their children meet those expectations.

A structural model was used by Reynolds and Walberg (1992) to determine the links among variables affecting mathematics achievement and mathematics attitude. Data was obtained from 3,116 adolescents from the Longitudinal Study of American Youth and from teacher surveys and parent interviews. Results indicated that prior achievement, motivation, previous attitude, and home environment were significant indirect factors affecting achievement, especially in the middle school years. Motivation was more influential at this grade level than home environment. The researchers also found that the amount of content covered in mathematics was an important factor as was students' perceptions of the teachers' effectiveness.

The Relationship Among Race, Gender, and Achievement

Lockheed, et al., (1985) studied the relationship of race/ethnicity and gender to student performance in middle school mathematics and found that differences in achievement were more often related to race/ethnicity than to gender. Their findings also concluded that little research had been focused on gender differences within racial/ethnic groups and pointed to the need for more empirical studies in this area.

A review of the literature on gender differences in mathematics achievement conducted by Leder (1992) led to his conclusion that gender differences in mathematics achievement are neither consistent nor significant during the earlier years of school, but that differences at the high school level on standardized achievement tests are often found in favor of males.

Kohr (1989) used three years of data obtained from the Pennsylvania Educational Quality Assessment Program to study achievement differences at grades five, eight, and eleven and found no gender differences at any level. These results were consistent with previous findings at grades five and eight, but were inconsistent with previous studies which consistently found gender differences in mathematics at the high school level.

Reduction in Achievement Gap

Secada (1992) studied the mathematics achievement of students by race, ethnicity, gender, socio-economics, and language proficiency to determine if the achievement gap between White and minority students were indeed closing. Secada's findings indicated that improvement was evident only for Black students on basic skills items. Secada also noted a stronger relationship between socioeconomic factors and the performance of White students than was found among Black or Hispanic students.

William F. Tate (1997) reported in his review of the literature of the past fifteen years that all racial/ethnic, socioeconomic, and gender groups showed improvement in mathematics performance and found that the achievement gap between White and other groups appeared to be closing on assessments of basic mathematical skills. He also found that, although the differences have been relatively insignificant, the performance of males on such assessments has tended to be superior to that of females. Although these later findings are more promising than previous studies, statistical analyses still report significantly lower achievement levels in mathematics of African American and Hispanic students. Findings by Ogle and Alsalam, (as cited in Anderson, 1997) indicate that although recent gains in achievement have been documented, African American and Hispanic students continue to score well below their White and Asian counterparts.

National Assessment of Educational Progress analyses showed improvement trends among ethnic-racial groups between 1973 and 1992, but the level of improvement varied greatly. Overall, at ages 9, 13, and 17, White students' average mathematics proficiency improved 10, 5, and 2 scale score points between 1973 and 1992. Gains in scale scores for African American students of the same age were 18, 22, and 16 points, respectively (Mullis, et al., 1994).

Intervention Strategies

Powell (1990) investigated factors associated with the under-representation of Black students in science and mathematics and concluded that underachievement and, therefore, below average representation in professions requiring expertise and advanced training in mathematics and science, are the result of learned helplessness caused by repeated exposure to failure and uncontrollable events. She further concluded that "learned helplessness in mathematics and science becomes more profound as African American children are exposed to high-density living conditions and uncontrollable noise" (p. 296). One resolution suggested by Powell was to reduce overcrowding and noise in mathematics and science classrooms.

Similar recommendations are found in the class-size research of Tennessee's Project STAR, a longitudinal study sponsored by the Tennessee General Assembly in 1985 to determine the effect of class size on achievement. Finn and Achilles (1990) used multivariate analysis of variance and repeated measures of analysis of variance on mean scores for White and minority students in various settings and class sizes. The researchers found that while both White and minority students achieved more in small reading classes, minority students benefited most from the smaller classes. Although the achievement gap was significant at 28.8 points, the differential was considerably less than the 41 and 49.4 point gaps found in regular sized classes.

Rodgers, Richardson, and Sherman (1999) studied the effectiveness of the Mathematics Enhancement Program (MEP) funded by the National Science Foundation in St. Louis. The program consists of two components, after-school tutoring for fourth through sixth graders and pre-algebra and algebra classes taught by university professors at the seventh and eighth grade levels. It is a cooperative learning, hands-on, and manipulatives-based program developed upon the philosophy that the achievement of minority students is negatively impacted in the upper elementary and middle school grades by limited access to challenging curriculum and decreased interest in mathematics. Post-treatment testing showed that 65% of the scores of students receiving tutoring increased from 0 to 11%, while 25% of the students' scores increased approximately 22%. These results were consistent across the targeted grades.

Similarly positive results were recorded for students in the seventh and eighth grade component of the MEP. Students in MEP scored as well as students selected for the classes through traditional exclusionary criteria.

Janice Patterson (1989) set out to evaluate the impact of the educational reform efforts of the 1980s in improving the achievement of at-risk students, including minorities. Data reviewed included the types of classes added at the district level in response to increased mathematics requirements, the content and curricular expectations of the courses added, and teachers' feedback regarding the implementation of those courses. The study found that courses added were most often minimum competency or lower-level content courses in which at-risk students were more likely to be enrolled. One of the more interesting findings of the study was the relationship between competency tests and curriculum. It was found that the curriculum in courses for at-risk students was likely to be determined by the content of competency tests and that competency-based curriculum may not result in the conceptual learning needed for success in more challenging mathematics courses.

Homogeneous grouping of students based upon achievement levels and perceived ability has historically been a topic of considerable debate and the basis for extensive research. Mathematics has typically been subject to grouping due to the perceived structure and sequential nature of the discipline (Ruthven, 1987) and because achievement in mathematics is most often perceived to be associated more with students' ability than with other factors. (Lorenz, 1982) Researchers have found teachers to favor homogeneous grouping in mathematics but have concluded that homogeneous grouping of students actually contributes to disparity rather than to a reduction in the achievement gap (Slavin, 1988; 1990).

Linchevski and Kutscher (1998) compared the achievement levels of students placed in heterogeneous and homogeneous groups in three related studies to determine the impact of grouping on achievement and concluded that homogeneous grouping contributes to, rather than decreases, the achievement gaps among performance groups. The study found that the achievement levels of average and lower performing students within the heterogeneous classes showed significant gains whereas the impact on the higher achieving students was insignificant. The researchers concluded that increases in the gap between achievement levels of students in homogeneous classes is the result of a decrease in the achievement of lower functioning students rather than an increase in the achievement of students placed in higher ability groups. Oakes (1988) found that disproportionate numbers of African American students are found in lower ability tracks and that tracking has seriously limited the opportunities of African Americans to participate in higher level mathematics courses.

Stringfield and Herman (1997) reported on programs, reform efforts, and school factors which have been found to have a positive impact on the achievement of educationally disadvantaged students. These researchers found that unlike traditional pullout programs such as Title I (Madden & Slavin, 1989), the most successful pullout programs provide one-on-one tutoring and computer assisted instruction. Several successful programs, such as *Success For All* and *Reading Recovery*, utilize highly focused tutoring models. These researchers also found that districts' attempts to restructure education which failed to achieve positive outcomes have generally resulted from poorly conceived and unreliably implemented programs and strategies. They concluded that when African American students are provided with quality educational programs beginning at preschool, which are consistently implemented within appropriate educational structures, they can achieve at levels at least equal to those of White students.

CHAPTER 3

Research Methodology

Subjects of the Field Study

This study included all students in Robertson County who took the mathematics subtests of the Tennessee Comprehensive Assessment Program (TCAP) achievement test in fifth grade in 1995, sixth grade in 1996, and seventh grade in 1997 and who coded themselves as either White or Black on the demographic data portion of the test booklet. Only those students who took the test in all three years were included in the sample. A total of 503 students were included in the sample; including 226 White males, 210 White females, 37 Black males, and 30 Black females. Students who were coded as "other minority" were excluded from the study because the size of that population was small in Robertson County and sufficient numbers of subjects were unavailable. The sample included students of all socio-economic and ability groups, including gifted and other special education students.

African American subjects represented 11% of the total sample. In 1997-98, African Americans made up 10.6% percent of the student population of Robertson County Schools. The sample is a valid representation of the racial composition of the system.

Procedures of the Field Study

The topic and description of the intended study were discussed with and approved by the investigator's graduate committee. Written permission to conduct the study was obtained from the director of schools. The investigation of the topic was sanctioned by the board of education as a timely and necessary study in an on-going effort to improve instruction for all students in the county.

Raw data were disaggregated in order to compare the mathematics scores of the four groups being studied; White males, Black males, White females, and Black females. Reports were produced which summarized the scores at the end of the students' fifth, sixth, and seventh grade years. Scale scores, national percentiles, and normal curve equivalents were generated for both the median and mean scores for each of the four groups in the areas of mathematics computation and mathematics concepts and application. In addition, the number and percentage of students represented within each national quartile were charted for three years for the subject groups. Finally, the cumulative gain during the three years was computed for each group.

Description of the Evaluation Instrument

Systemwide archival data from the Tennessee Comprehensive Assessment Program achievement test was disaggregated and analyzed using the Testmate test-management software for scanning, scoring, and reporting assessments.

No student-identifiable information was produced in the disaggregation and analysis of data. Student data used in the study were imported directly into the Testmate program by the University of Tennessee Testing and Evaluation Center and was securely stored only on computers owned by the system. The confidentiality of all student-identifiable information was protected by security procedures in place within the school system. All security procedures were followed as prescribed.

CHAPTER 4

Presentation, Interpretation, and Discussion of the Data

Introduction

The purpose of this chapter is to present the findings of the study as they relate to the null hypotheses presented in Chapter 1.

Hypothesis I: There will be no difference found in the achievement levels among the four subject groups; White males, Black males, White females, and Black females in the areas of mathematics computation and mathematics concepts and application.

Tables I and II show the mean and median scale scores respectively and their normal curve equivalents for each of the subject groups in mathematics computation.

Table I

Mean Scale Scores and Normal Curve Equivalents in Mathematics Computation

	White Males		**Black Males**	
	Scale Score	Normal Curve	Scale Score	Normal Curve
1995	735	56	711	43
1996	750	53	714	37
1997	781	56	751	43
	White Females		**Black Females**	
	Scale Score	Normal Curve	Scale Score	Normal Curve
1995	740	58	714	45
1996	753	54	736	47
1997	790	60	760	48

Table II

Median Scale Scores and Normal Curve Equivalents in Mathematics Computation

	White Males		Black Males	
	Scale Score	Normal Curve	Scale Score	Normal Curve
1995	736	54	719	44
1996	750	50	721	37
1997	770	51	754	44
	White Females		**Black Female**	
	Scale Score	Normal Curve	Scale Score	Normal Curve
1995	740	57	723	47
1996	756	54	745	48
1997	784	58	752	43

Tables III and IV show the mean and median scale scores, respectively, and their normal curve equivalents for the subject groups in mathematics concepts and application. Both sets of statistics were generated in order to determine if any difference found was consistent with both the mean and median scores. A difference was found between the achievement levels of White and Black students in both mathematics computation and mathematics concepts and application across all three years. White students consistently scored above Black students in both areas of mathematics, with the greater difference appearing in the area of mathematics concepts and application.

Gender differences were less pronounced with female students of both races scoring above their male counterparts in mathematics computation and Black females scoring slightly above Black males in mathematics concepts and application in two of the three years studied. White males consistently outperformed White females in the area of mathematics concepts and application.

The normal curve equivalents for the mean and median scale scores in both mathematics computation and mathematics concepts and application were found to be consistently above the 50th national percentile for male and female White students and below the 50th national percentile for both male and female Black students. The differences in the mean achievement levels between White and Black males ranged from 16 percentile points in 1996 to 13 percentile points in both 1995 and 1997. White females scored 13 percentile points higher than Black females in 1995, 7 percentile points higher in 1996, and 12 percentile points higher in 1997. There was no indication found that the apparent achievement gap between this group of White and Black students had narrowed significantly during the three-year period.

The differences found between the normal curve equivalents of the mean scores of White male and female students during this period were consistent and slightly in favor of females in mathematics computation and in favor of males in mathematics concepts and application.

Black female students' scores were only slightly above those of Black males, except in 1996. In that year, a 10 percentile difference was observed in favor of Black females in mathematics computation. The difference noted in that year was the result of a significant decrease in the scores of Black males. A sizable decrease was also noted in the computation scores for both male and female White students.

The median national percentile is the descriptive statistic used by the state of Tennessee to report relative standing compared to the state and nation. Table V lists the median national percentiles in mathematics computation of the subject groups.

Table V

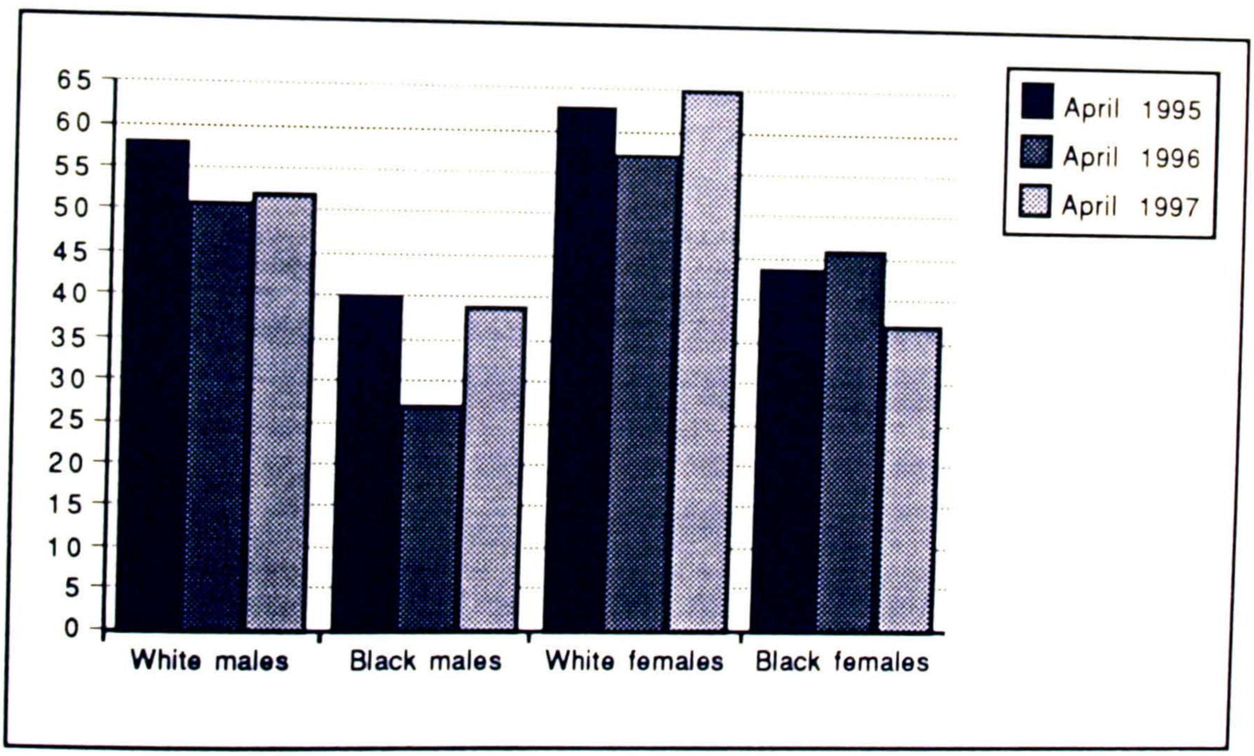
Median National Percentiles in Mathematics Computation

	White Males	**Black Males**	**White Females**	**Black Females**
1995	58	40	63	44
1996	51	27	57	46
1997	52	39	65	37

The median national percentiles for White students were consistently above the 50th national percentile, while the median national percentiles for Black students were consistently below the 50th percentile. Percentile rankings in mathematics computation for males were 18 points higher for Whites in 1995, 24 points higher for Whites in 1996, and 13 points higher for Whites in 1997. Any decrease in disparity between male groups was the result of a decline in the scores of White males rather than achievement gains of Black males, as illustrated in Chart I.

Chart I

Median National Percentiles in Mathematics Computation



Comparisons of the median national percentiles (MNP) for female groups show similar superior performance of White females as illustrated in Chart I. In 1995, the MNP for White females was 19 points higher. In 1996, the difference was reduced to 11 points as a result of a decline in the score for White females and a slight improvement in the score for Black females. In 1997, the disparity jumped to 28 points as a result of both improvement in White female performance and a decline in the score for Black females.

Table VI shows the performance of the subject groups in mathematics concepts and application using the median national percentile. Even greater disparity is evidenced by this data between racial groups, and some evidence of gender disparity is noted between the scores of students in the White subgroup only, as seen in Chart II.

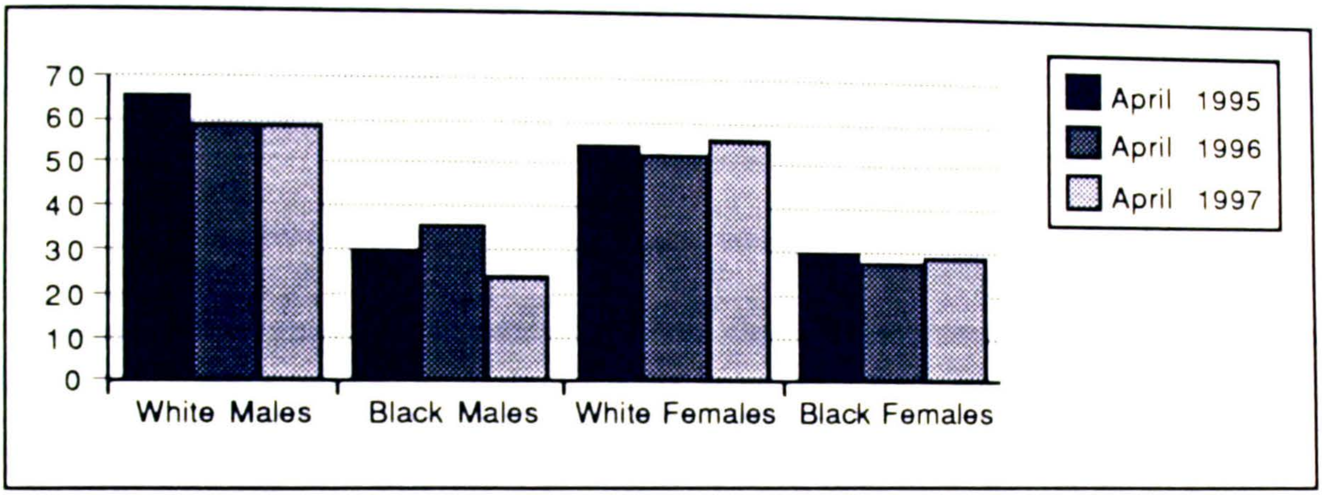
Table VI

Median National Percentiles in Mathematics Concepts and Application

	White Males	**Black Males**	**White Females**	**Black Females**
1995	66	30	54	30
1996	59	36	52	28
1997	59	24	56	29

Chart II

Median National Percentiles in Mathematics Concepts and Application



White males outscored Black males by 36 points in 1995, 23 points in 1996, and 35 points in 1997. Again, reductions in the performance gap within the male group were the result of declines in the scores of White males.

White females outscored Black females in concepts and application by 24 points in 1995 and in 1996, and by 27 points in 1997. The percentile rankings and the gap between the achievement levels of the two female groups were relatively stable over the three-year period.

<u>Hypothesis II:</u> There will be no difference found in the cumulative achievement gains among the four subject groups; White males, Black males, White females, and Black females in the areas of mathematics computation and mathematics concepts and application.

Achievement gains are illustrated in Table VII for both areas of mathematics. This table shows the year-to-year gain and cumulative gain of the mean scale scores of the subgroups. Gains are determined by the increase in scale scores from year to year. Cumulative or total gain is the sum of the annual gains.

Table VII

Cumulative Gain in Mean Scale Scores in Mathematics Computation and in Mathematics Concepts and Application

	Computation	Concepts and Application
White Males		
1995-96	15	16
1996-97	31	06
Total Gain	46	22
Black Males		
1995-96	03	12
1996-97	37	17
Total Gain	40	29
White Females		
1995-96	13	14
1996-97	43	16
Total Gain	56	30
Black Females		
1995-96	22	10
1996-97	24	23
Total Gain	46	33

Table VIII illustrates the annual gains and total gains of each subgroup using the median scale score. Values given in this chart represent scale score point increases.

Table VIII

Cumulative Gain in Median Scale Score in Mathematics Computation and in Mathematics Concepts and Application

White Males

	Computation	Concepts and Application
1995-96	14	10
1996-97	20	13
Total Gain	34	23

Black Males

	Computation	Concepts and Application
1995-96	02	26
1996-97	33	-2
Total Gain	35	24

White Females

	Computation	Concepts and Application
1995-96	16	15
1996-97	28	17
Total Gain	44	32

Black Females

	Computation	Concepts and Application
1995-96	22	16
1996-97	07	14
Total Gain	29	30

There is a considerable difference in the cumulative gain using the mean scale score and the cumulative gain using the median scale score in both areas of mathematics. Chart III shows the comparison of gains of the mean and median scale scores for each subgroup in mathematics computation, while Chart IV provides a comparison of the gains in mathematics concepts and application. The gains of the mean scale scores were considerably higher for both areas of mathematics, indicating a wide range of scores.

The differences found among gains for both the mean and median scale scores tended to be related more to gender than to race with females' achievement gains surpassing males' gains.

Chart III

Comparison of the Cumulative Gain of the Mean and Median Scale Scores in Mathematics Computation

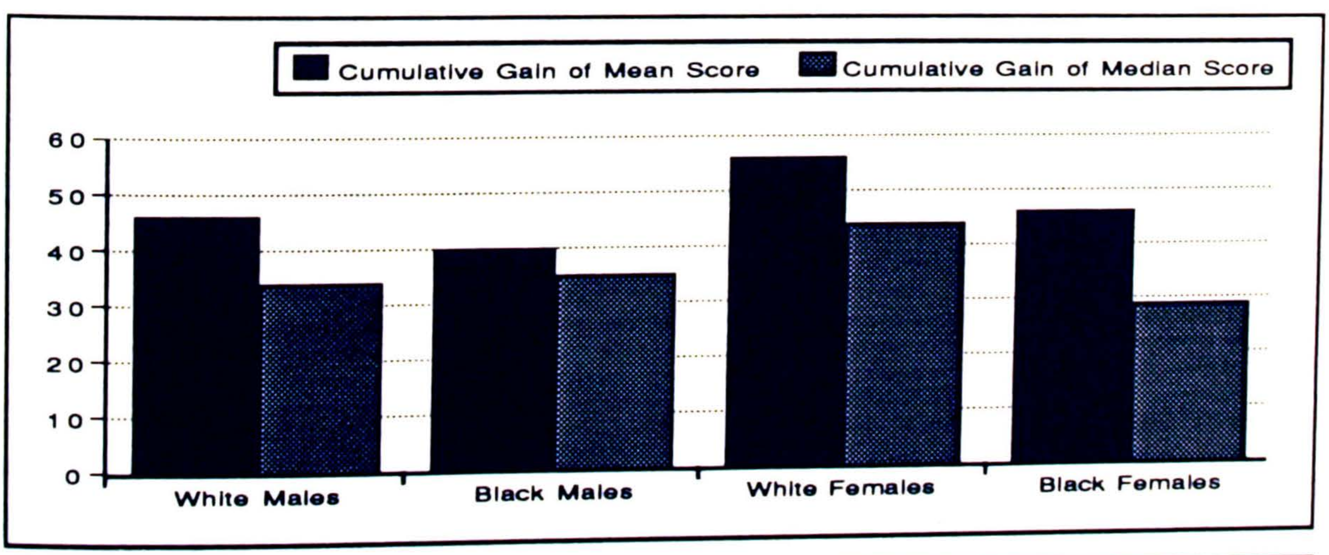
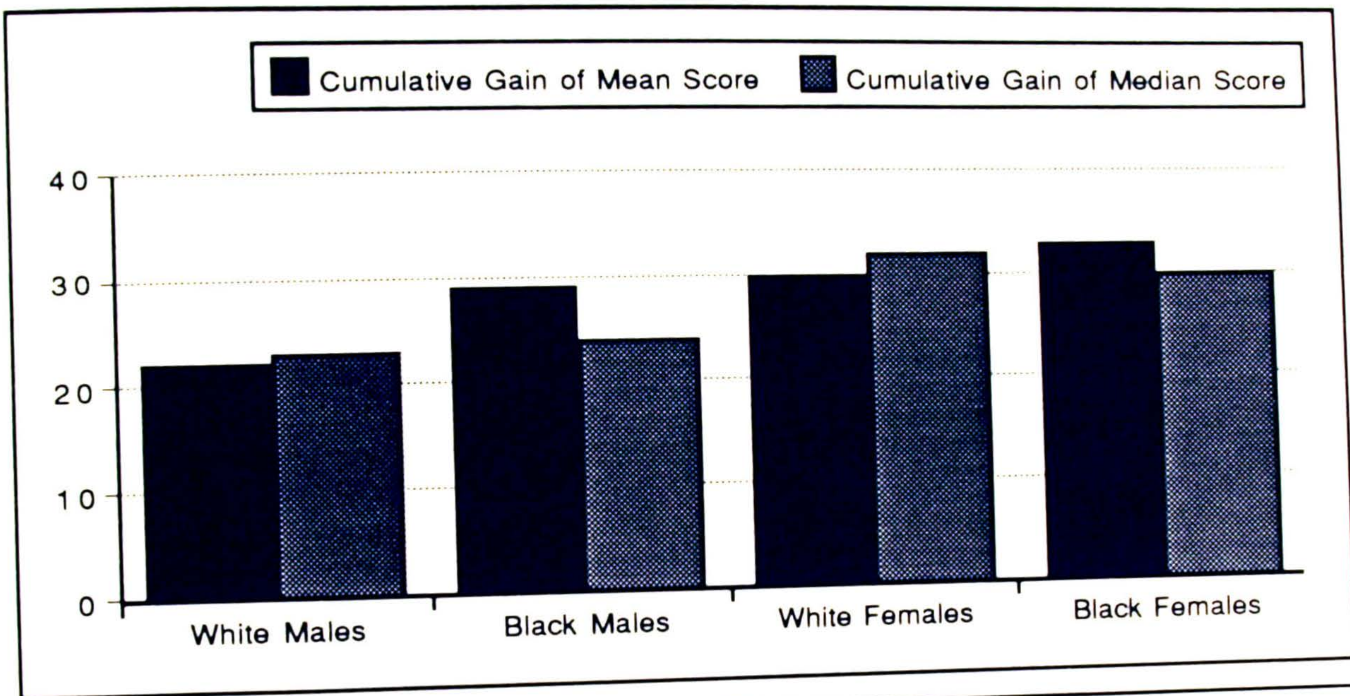


Chart IV

Comparison of the Cumulative Gain of the Mean and Median Scale Scores in Mathematics Concepts and Application



Using the gains obtained from the mean scale scores, White female students accrued the greatest total gain in mathematics computation with 56 scale score points, while the 46 scale score point gain of Black females was equal to the gain of White males and 6 scale score points higher than that of Black males. Black females posted the greatest gains in mathematics concepts and application with a 33 scale-score-point improvement, while the gains of White females and Black males were comparable at 30 points and 29 points, respectively. White males showed the least improvement in mathematics concepts and application with a total of 22 scale score points.

Gender differences were evident in mathematics computation in both subgroups with White females gaining 10 points above White males, and Black females gaining 4 points greater than Black males.

When looking at the gains of the median scale scores, the picture changes dramatically. Although White females still posted the greatest gains in computation with 44 points, Black males had a 35 point gain, followed by White males with 34 points and Black females with 29 points.

In concepts and application, females of both races achieved greater gains. White females and Black females had similar gains with 32 and 30 points, respectively, while White males and Black males had similar gains of 23 and 24 points, respectively.

Hypothesis III: There will be no difference within any group between the cumulative gains in the area of mathematics computation and those in the area of mathematics concepts and application.

Charts V and VI compare the two areas of mathematics using the cumulative gains for mean and median scale scores from 1995 to 1997. The amount of gain from 1995 to 1996 and from 1996 to 1997 was added to determine the cumulative gain for each group. Since only two gains were derived from the three years of data, cumulative gain was used for comparison purposes rather than three-year average gain.

Chart V

Cumulative Gain in Mean Scale Scores in Mathematics Computation and in Mathematics Concepts and Application

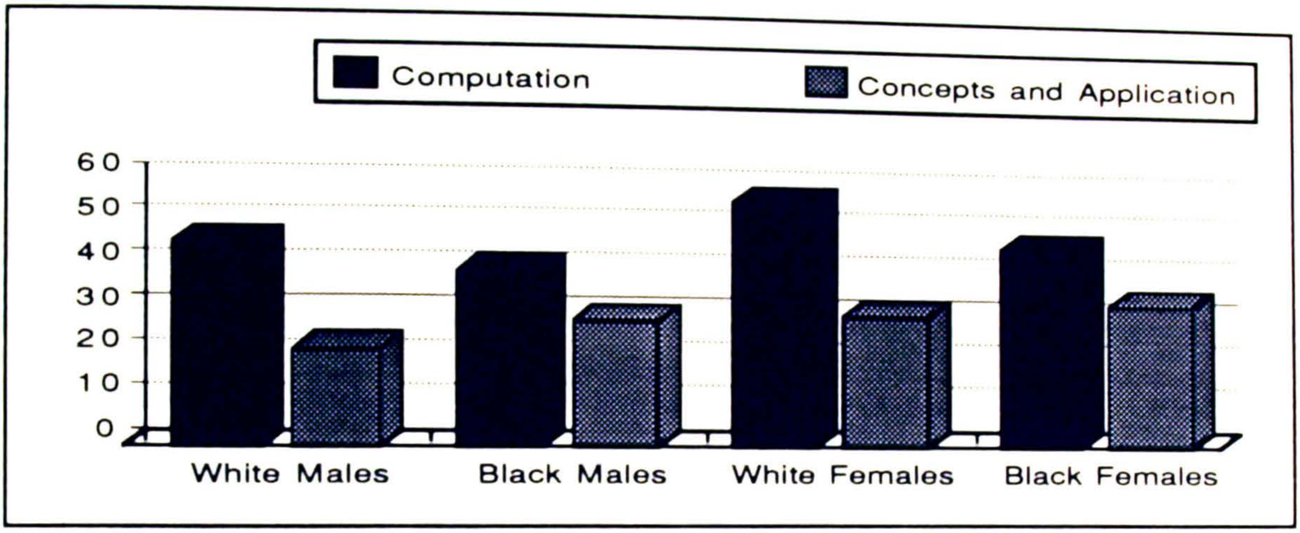
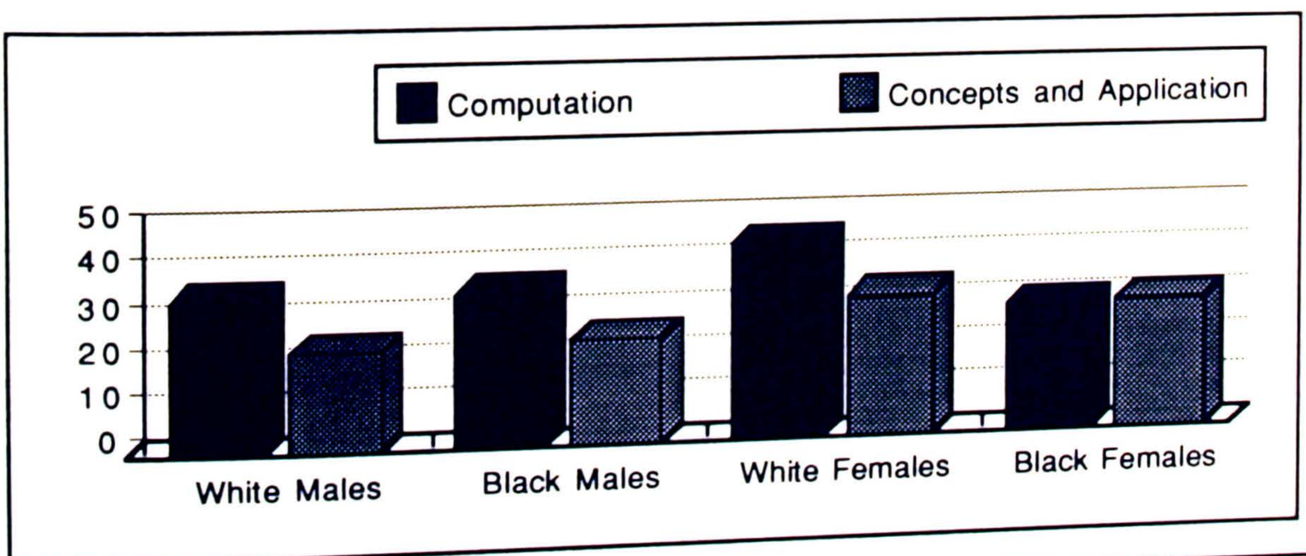


Chart VI

Cumulative Gain in Median Scale Scores in Mathematics Computation and in Mathematics Concepts and Application



There was a significant difference evidenced within each group of students between the cumulative gains in the mean scale scores (Chart V) in mathematics computation and in gains in mathematics concepts and application. All four subgroups charted superior gains in the area of mathematics computation. The gain of White females was 26 scale score points greater in computation than in concepts and applications. White males posted a similar difference of 24 scale score points. While the variance was less for Black students, 11 points for males and 13 points for females, the finding is equally important.

The chart comparing the cumulative gains of the median scale score (Chart VI) presents a similar picture for males and White females. Using the median score, the cumulative gain of both White and Black males was 11 scale score points higher on mathematics computation than on concepts and application. The gain for White females was 12 scale score points higher on computation, but the gain for Black females was 1 scale score point higher in concepts and application.

Hypothesis IV: The percentage of students from each of the subject groups; White males, Black males, White females, and Black females found in each national quartile will approximate the normal distribution of the national population as a whole in mathematics computation and mathematics concepts and application.

Table IX shows the actual number of students in each quartile in mathematics computation, while Table X shows the number of students in each quartile in mathematics concepts and application.

Table IX
National Quartile Counts in Mathematics Computation

White Males

Quartiles	76-99	51-75	26-50	1-25
1995	76	62	49	39
1996	55	62	69	40
1997	77	40	62	47

Black Males

Quartiles	76-99	51-75	26-50	1-25
1995	4	8	12	13
1996	3	3	9	18
1997	5	9	9	14

White Females

Quartiles	76-99	51-75	26-50	1-25
1995	71	59	53	27
1996	54	64	63	29
1997	75	70	46	19

Black Females

Quartiles	76-99	51-75	26-50	1-25
1995	1	12	8	9
1996	6	8	7	9
1997	6	6	8	10

Table X
National Quartile Counts in Mathematics Concepts and Application

White Males

Quartiles	76-99	51-75	26-50	1-25
1995	82	64	49	30
1996	77	55	56	37
1997	76	59	39	51

Black Males

Quartiles	76-99	51-75	26-50	1-25
1995	4	6	14	12
1996	0	8	13	15
1997	1	8	9	18

White Females

Quartiles	76-99	51-75	26-50	1-25
1995	49	69	57	35
1996	50	61	57	42
1997	57	60	57	36

Black Females

Quartiles	76-99	51-75	26-50	1-25
1995	2	4	11	13
1996	2	5	10	13
1997	3	3	10	14

The national quartiles divide the national population into four equal segments. Each national quartile represents 25% of the national sample. Unequal or skewed distributions are determined by the amount above or below 25 percent in each quartile. Tables XI and XII show the percentage of each group whose scores fell within each of the national quartiles in mathematics computation and in mathematics concepts and application for each of the three years of the study.

Table XI
Percent of Subjects in Each National Quartile in Mathematics Computation

White Males

Quartiles	76-99	51-75	26-50	1-25
1995	34	27	22	17
1996	24	27	31	18
1997	34	18	27	21

Black Males

Quartiles	76-99	51-75	26-50	1-25
1995	11	22	32	35
1996	8	19	24	49
1997	14	24	24	38

White Females

Quartiles	76-99	51-75	26-50	1-25
1995	34	28	25	13
1996	26	30	30	14
1997	36	33	22	9

Black Females

Quartiles	76-99	51-75	26-50	1-25
1995	3	40	27	30
1996	20	27	23	30
1997	20	20	27	33

These tables show the percentage of students who scored from the 76th to the 99th national percentiles, the percentage who scored from the 51st to the 75th national percentiles, the percentage who scored from the 26th to the

50th percentiles, and the percentage in the 1st to the 25th national percentiles.

Table XII

Percent of Subjects in Each National Quartile in Mathematics Concepts and Application

White Males

Quartiles	76-99	51-75	26-50	1-25
1995	36	28	22	13
1996	34	24	25	16
1997	34	26	17	23

Black Males

Quartiles	76-99	51-75	26-50	1-25
1995	11	17	39	33
1996	0	22	36	42
1997	3	22	25	50

White Females

Quartiles	76-99	51-75	26-50	1-25
1995	23	33	27	17
1996	24	29	27	20
1997	27	29	27	17

Black Females

Quartiles	76-99	51-75	26-50	1-25
1995	7	13	37	43
1996	7	17	33	43
1997	10	10	33	47

Finally, Tables XIII and XIV delineate the three-year average percent of students in each national quartile by race and gender in mathematics computation and in mathematics concepts and application, respectively.

Table XIII

Three-Year Average Percent in Each National Quartile in Mathematics Computation

Quartiles	76-99	51-75	26-50	1-25
White Males	31%	24%	27%	19%
Black Males	11%	22%	27%	41%
White Females	32%	30%	26%	12%
Black Females	14%	29%	26%	31%

Table XIV

Three-Year Average Percent in Each National Quartile in Mathematics Concepts and Application

Quartiles	76-99	51-75	26-50	1-25
White Males	35%	26%	21%	17%
Black Males	05%	20%	33%	42%
White Females	25%	30%	27%	18%
Black Females	08%	13%	34%	44%

These tables show a disproportionate percentage of Black students in the lowest quartile in both areas of mathematics, with the greatest discrepancy found with Black females in concepts and application. 41% of Black males and 31% of Black females, compared to 19% of White males and 12% of White females, fell within the lowest level of achievement in mathematics computation. 42% of Black males and 44% of Black females show achievement levels within the lowest quartile in mathematics concepts and application, compared to 17% of White males and 18% of White females. Conversely, a greater percentage of White males and females, compared to the national average, were found to be performing in the upper quartiles in both areas of mathematics. 31% of White males and 32% of White females scored in the top quartile in mathematics computation, and 35% of White males scored in the upper quartile in mathematics concepts and application. 55% of White males and 62% of White females were above the 50th percentile in mathematics computation, and 61% of White males and 55% of White females were above the 50th percentile in mathematics concepts and applications. 33% of Black males and 43% of Black females scored above the 50th percentile in mathematics computation, while only 25% of Black males and 21% of Black females scored above the 50th percentile in mathematics concepts and application. These findings support conclusions of previous researchers that, if the gap is closing between Whites and minorities, progress is more likely to be seen in the area of mathematics computation.

Charts VII and VIII illustrate that the greatest disparity in performance scores exists in the top and bottom quartiles. This can be seen by comparing the size of each section for the ethnic and gender groups. Those sections representing the middle quartiles (percentiles 76 to 26) are somewhat comparable for all groups. However, considerable deviation from the norm can be seen in the sections representing the highest and lowest performing students.

Chart VII

Three-Year Average Percent in Each National Quartile in Mathematics Computation

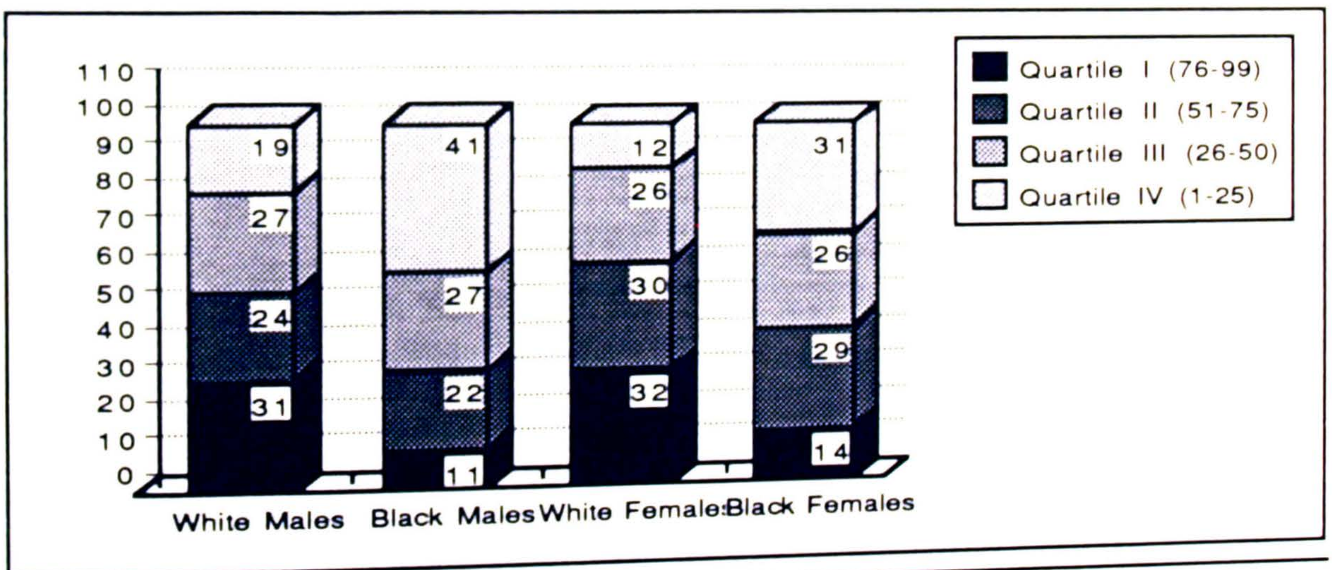
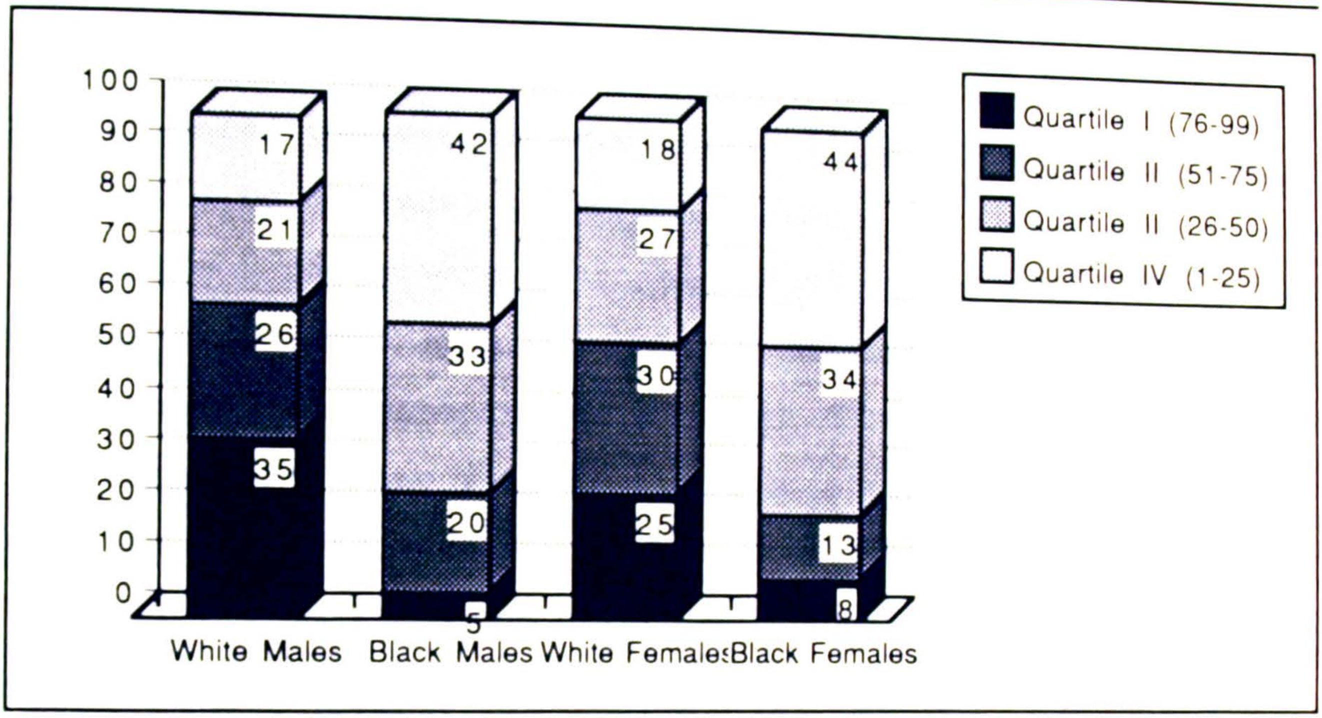


Chart VIII

Three-Year Average Percent in Each National Quartile in Mathematics Concepts and Application



CHAPTER 5

Summary and Conclusions

The purpose of this study was to compare the achievement levels and achievement gains of four groups of students; White males, Black males, White females, and Black females, across three years to determine (a) if an achievement disparity was present among the groups, (b) if the achievement gains were equitable among the groups, (c) if the groups scored comparably in both mathematics computation and in mathematics concepts and application, and (d) if the distribution of the four groups approximated the normal distribution across the national quartiles.

Data from the TCAP achievement test was disaggregated using the *Testmate* computer software program developed by CTB/McGraw Hill. Only those students who had scores for all three years were included in the sample.

The findings resulted in the rejection of the null hypothesis that no disparity existed among the groups. A significant difference was found in both the mean and the median national percentiles, with White students outscoring Black students in each of the three years. Evidence of gender disparity was inconsistent from year to year; however, White females clearly outperformed all other groups in mathematics computation, and White males excelled in mathematics concepts and application.

The data did not support the second null hypothesis that no difference would be found in the cumulative gains of each of the four groups. The disparity in achievement gains was found to be related to gender rather than to race. White females accrued the greatest gain in mathematics computation, while the gain of Black females was equal to the gain of White males and higher than the gain of Black males. In mathematics concepts and application, Black females posted the greatest gain, while the gains of White females and Black males were comparable. Although White males achieved higher median national percentile rankings in concepts and application, they showed the least improvement in this area of the four groups.

The third null hypothesis, that no difference would be found between the scores of each group for mathematics computation and for mathematics concepts and applications, was also rejected. Scores in mathematics computation were found to be higher for all groups, except White males.

The fourth hypothesis, which proposed that scores would be equally distributed across the national quartiles, was also rejected. The data clearly show a greater percentage of scores of Black students falling into the lowest quartile, while the scores of White students tend to be more reflective of the normal distribution. Deviations from the norm in the distribution of the scores of White students tend to be skewed toward the higher quartiles.

In summary, this investigation supports previous studies which concluded that a significant disparity exists between the achievement scores of White and minority students, but it fails to reflect findings which suggest that the achievement gap is closing. In this study, Black males tend to have the lowest performance scores of all groups, as well as the lowest gains in mathematics computation. This result is inconsistent with national findings that the achievement gap is closing in the area of basic computational skills. Gender differences were evident, with females posting the greatest gains in both areas of mathematics. White females achieved most in mathematics computation, while Black females recorded the largest gains in mathematics concepts and application.

This study indicates that both gender and racial disparity appear to be issues which would warrant consideration and further study. Ethnic disparity is readily seen in the achievement levels of White and Black students in both mathematics computation and in mathematics concepts and application. Gender disparity is more evident in achievement gains. Further study to identify the causal factors associated with these phenomena is recommended.

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