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Gender Bias in Selection for Honors Mathematics at Kempsville Middle School

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GENDER BIAS IN SELECTION FOR HONORS MATHEMATICS AT KEMPSVILLE MIDDLE SCHOOL

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CHAPTER I

INTRODUCTION

There has been much progress in gender equality in Western cultures; however, there still exists numerous occurrences of gender discrimination in all aspects of life. Despite the training of teachers, this gender bias is still prevalent in the classroom (Sadker and Sadker's study (as cited in "New Research," 1994)). If females are going to attain equality in their chosen career fields, then equality in education is crucial.

Much effort has been expended by Federal, State, and local governments to mandate and regulate equal opportunity. Title IX, the Federal law that addressed sexual discrimination in the school, is now over twenty years old. However, the intent of the most intricate policies and law can be completely circumvented by either the conscious or subconscious biases of those who are actually involved in the teaching, testing, and screening processes. Teachers and administrative officials have the ability to place a personal bias in many school procedures. Often, this can be done in so subtle a manner that it is difficult to detect the bias.

This study was to focus the expanse of the sexual discrimination issue down to a small and specific situation. The issue was whether or not females were biased against when assignments were made to the honors mathematics courses at Kempsville Middle School. Mathematics, specifically algebra and pre-algebra, have been the basic gateways to many future courses and careers (Everybody Counts, 1989, pp. 1-6). If bias occurred in mathematics selection procedures in the middle school, many females would lose the opportunity to adequately begin their challenge of the future.

Statement of the Problem

The problem of this study was to determine a correlation between the gender of seventh and eighth grade students at Kempsville Middle School and their assignment to honor mathematics classes as an indicator of gender bias in mathematics classroom assignment.

Research Goals

The following objectives were established to guide the conduct of this research study.

1. To identify the percentage of females enrolled in the general population of the seventh and eighth grades at Kempsville Middle School.
2. To identify the percentage of females enrolled in the seventh and eighth grade honors mathematics courses at Kempsville Middle School.
3. To determine if a significant difference exists between the percentages determined in objectives one and two above.
4. To interview the personnel involved with the honors mathematics selection process at Kempsville Middle School to precisely identify the honors selection process and to review it for gender impartiality.

Background and Significance

The overall representation of all people in mathematics and science careers is small and declining. The portion of females in mathematics and science careers is a small part of this small number. Students today are offered more alternatives to mathematics than they are offered incentives. Without a dedicated effort to offer an opportunity for all to meet their full potential, few students will continue in the study of mathematics (Everybody Counts, 1989, p. 17).

For many reasons that stem from culture and tradition, females have not traditionally entered a mathematics based career (Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 225-226; Everybody Counts, 1989, p. 21). However, white males, once considered the primary contributor to the economy, will be only 15 percent of the net additions to the labor force between 1985 and 2000 (Johnson and Packer, 1987, p. 95). The pool of white males is insufficient to meet the demands of future society, especially in the field of mathematics (National Science Foundation, 1992, U. S. Congress, Office of Technology Assessment, 1988a, 1988b, and Vetter, 1990 (as cited in Clewell, Anderson, and Thorpe, 1992, p. 1)). In order to meet the work demands of the future, it is imperative that all people of both sexes be allowed to develop their mathematics abilities to the utmost .

Females and males show similar interest and ability in mathematics throughout the elementary years (Clewell, Anderson, and Thorpe, 1992, p. 6; Everybody Counts, 1989, p. 21). Differences in mathematics performance between the sexes is primarily due to family, school, and society gender stereotypes (Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 245-247; Clewell, Anderson, and Thorpe, 1992, pp. 3-12; Everybody Counts, 1989, p. 22). Beginning in the middle school years, the female drop-out rate in mathematics courses is a significantly higher rate than that of males. Obviously, all females cannot be forced into advanced mathematics subjects in some sort of misguided effort to shift the percentage of females in mathematics careers. However, it is necessary that females be given every opportunity to succeed in mathematics. Furthermore, those who show the interest and ability to succeed in advanced mathematics courses must be given the opportunity to excel.

The issue of whether or not females improve their representation and their equality in traditionally male dominated career areas is moot unless females are given equal treatment and opportunity in their education. If females are restrained at the very beginning of their lives, and if they receive an education that does not allow them to best develop their talents, then it will be all the more difficult for them to compete later in life on an equal footing with males. No one can arrive at a finish line if they are stopped while still in the starting blocks. The intent and spirit of national, state, and local laws must be reflected in the people who implement the laws on a day-to-day basis. The topic of this research paper was to investigate and address compliance with the law in one particular decision at one particular location. When coupled with other reviews of a similar nature, a true picture can be developed throughout a larger area and in a broader scope as to whether or not females are being given an equal access to the future.

Limitations

This research paper was limited to the current seventh and eighth grade enrollment at Kempsville Middle School, not including special education students. This fact was due to the limited access to enrollment data.

Furthermore, Kempsville Middle School changed two years ago from a junior high school format to a middle school format. The procedures and personnel in place at the time of the study reflected a process that was fairly new.

Assumptions

During this study, the following assumptions were made:

1. The enrollment records of the administration personnel and the teachers of the classes in question at Kempsville Middle School were complete and accurate.
2. No major exodus of female students to private or home schools had occurred because of the selection policy in place at Kempsville Middle School. This assumption was two-fold. First, females assigned to an honors mathematics class remained in the course of study and did not exit to a different school (in the hope of obtaining better training for a gifted child). Secondly, females who should have been assigned to the honors mathematics course, but who were not, did not exit to another school (in the hope of receiving a more favorable review). Therefore, the count of females in the regular core and the honors mathematics classes actually reflected the school's screening process.
3. The review of all seventh and eighth grade mathematics classes negated any abnormality that could be injected by the review of just a single teacher's class.
4. This review assumed that male and female students had the same capability to accomplish the subject material. In other words, there were no biological differences between males and females that would affect their ability to perform mathematics skills.

5. This review assumed that no outside force (e.g., parents, church) was consciously or unconsciously acting on the children to prevent female students from working at their potential. This assumption included both efforts present at the time of the study as well as any past efforts that could have affected student motivation.

6. The students in the special education classes who were not in either a core or an honors mathematics class were not counted in this study. Their curriculum is protected by the Privacy Act, and no attempt was made to improperly access their records. Furthermore, their assignment to special education classes is based on the identification of special student needs and is outside the normal chain of events used in the core and honors classes. Finally, the number of special education students is small as compared to the overall population and is assumed to be statistically insignificant.

Procedures

This study was conducted in two parts. The first part was a review of the classroom enrollment in the seventh and eighth grades. The percentage of females in the overall population of the grade was compared to the percentage of females in the honors mathematics classes of each grade. A statistical analysis was conducted to determine if a significant difference existed.

The second part of the study was an interview with each of the teachers involved in the honors mathematics class selection process. A review of the procedures attempted to indicate if a gender bias was injected, or could have been injected, into the process either consciously or subconsciously. This was not an attempt to psycho-analyze the personnel involved, but rather to investigate the steps of the process being reviewed.

Definition of Terms

The following definitions were routinely used throughout the report and are presented to better enable the reader to understand the report.

1. Core Mathematics - the standard mathematics course for a particular grade. In seventh grade, the core mathematics is a general mathematics review. In eighth grade, the core mathematics is a pre-algebra course.
2. Equality - correspondence in quantity, degree, value, rank, ability, etc. (The Random House Dictionary of the English Language, 1966, p. 481).
3. Equity - the quality of being fair or impartial (The Random House Dictionary of the English Language, 1966, p. 482).
4. Gender bias - a particular tendency or inclination concerning the gender of a person which prevents unprejudiced consideration (The Random House Dictionary of the English Language, 1966, p. 144).
5. Honors Mathematics - the advanced mathematics class in a particular grade. In seventh grade, the honors mathematics is a pre-algebra course and a prerequisite for the eighth grade honors mathematics course. In eighth grade, the honors mathematics is an algebra course and gives credit towards high school graduation. The honors path is not only a year accelerated above the core mathematics, it is a more in-depth study of the topics. Of note, the advanced timetable offered by the

honors path is required if a student desires to take Calculus in the twelfth grade.

6. Sex discrimination - the treatment or consideration of, or making a distinction in favor of or against, a person or thing based on sex (gender) rather than individual merit (The Random House Dictionary of the English Language, 1966, p. 411).

7. Stereotyping - a simplified and standardized conception or image invested with special meaning and held in common by members of a group (The Random House Dictionary of the English Language, 1966, p. 1394).

Overview of Chapters

This study was to determine specifically if gender bias and sex discrimination occurred in the selection of students to the seventh and eighth grade mathematics honors classes at Kempsville Middle School. Chapter I provided an introduction, statement of the problem and the goals that regulated this study, as well as an overview of the procedures used. Furthermore, Chapter I addressed the limitations, assumptions, and definitions that related to this study.

Chapter II reviewed the literature that related to the topic of gender bias in education. Chapter III provided the exact procedures and methods used in the study. Chapter IV reported the data that was discovered in this study. Chapter V discussed the conclusions that can be drawn from this study and offered potential ideas for future research.

CHAPTER II

REVIEW OF LITERATURE

The goal of this research study was to collect and analyze data related to the selection of females for the honors mathematics courses in seventh and eighth grades at Kempsville Middle School. In order to understand the study, it is necessary to review certain topics prior to reviewing and evaluating the data collected in the study.

This Review of Literature is focused on several issues. The first is an overview of the history of the education of females, primarily in the U. S. The next is a consideration of the need for females in today's workplace. Finally, there is a review of today's education of females in the U. S., particularly in mathematics. The emphasis of this last sub-section is on the changes in educational practices and attitudes that allow females to better meet today's workplace requirements. A summary concludes the Review of Literature chapter.

History of the Education of Females

Lynn Osen stated the following in her book about female mathematicians.

"In his fantasy, Through the Looking Glass, Lewis Carroll has the Red Queen say to Alice, 'It takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!' (p. 1189).
Carroll (or C. L. Dodgson) was an English mathematician and logician who drew on his specialized knowledge to perfect the art of imaginative writing. It is surely a part of his genius that he has this dialogue take place between two females, for nowhere is this metaphor more applicable than it is for women in mathematics." (Osen, 1974, p. 163).

The bias against females that appears today in mathematics education has long roots in history. The social definition of what is feminine has long been at odds with the mathematics and hard science mentality. For a female to work in these fields was stating that she was not feminine (Osen, 1974, p. 165; Perl, 1978, p. 198).

In tribal cultures, females traditionally assumed a vital role by the fireside while males sought their business beyond the home. As civilizations developed, this segregation of duties remained entrenched in most cultures. Only males needed serious education because only males needed to venture outside the duties of the home. Females needed to concentrate on those duties of agriculture and house work that would occupy the rest of their lives (Woody, 1980, pp. 1-2).

By the late 1700s, the idea of a formal education for females began to move beyond philosophical debate. In England, Hannah More (1745) and Mary Wollstoncraft (1759) were teachers and writers of books for formal female education. Wollstoncraft opened a floodgate of follow-on literature, and More was determined to train females to be thoughtful, rationale, and not just "objects of flattery" (Woody, 1980, pp. 30-33).

In Colonial America, the views of the early settlers were carried over from England, France and Germany. Through the mid 1800s, the dominant opinion was that the female mind was different from the male mind, and it could not be educated beyond domestic duties. The mind of the female, as was the female herself, inferior. The only proof offered was "common sense" or "observed fact" (Woody, 1980, pp. 88-90).

Beginning in the mid and later 1700s, some people began to acknowledge the intelligence, and possibly the equality, of females. The female academy and seminary approach to the education of females was predominant from 1750 to 1865. Educators tried to stress a "solid" and "disciplined" education. The education of females coupled with the rise in the number of female colleges began to produce much data that contradicted long held beliefs. Unfortunately, much of what was stated about a female's ability was more opinion than documented fact (Woody, 1980, pp. 90-92, 107-109). Also, there was much popular feeling raised about the supposed horror of females being anyplace else but the home. This male backlash considered the education of females, beyond what was necessary for them to conduct their home duties, to be the "first step in the destruction of the home, society, and the nation" (Woody, 1980, pp. 100-103).

Public schools grew in popularity from 1820 to 1865 as states stressed inexpensive vocational training. High schools and seminaries stressed English and specialized training. By the mid 1800s, females, who were appearing in hundreds of occupations, began to dominate the teaching profession in the new public schools forming nationwide. The education of females became necessary because females were thought to be the proper choice for conducting the education of children. This profession was a natural extension of the female's traditional duty of educating children in the home. However, there still was the complaint that many females were being educated for no reason at all since they were prevented from using their education in many other career fields (Woody, 1980, pp. 108-110).

In 1852, the American Women's Educational Association was formed. Its aim was to unite females in the fight to obtain a good education for the good employment of a female in her traditional domestic role. The word "domestic" reassured males that the

Association was not trying to "transplant women from the position which Divine Providence has assigned them" (Woody, 1980, pp. 113-114). Many considered the training of females to do anything but domestic duties was a waste of effort. Female colleges, however, slowly developed better academic curricula primarily in the attempt to appear less "frilly" (Perl, 1978, p. 198; Woody, 1980, pp. 113-117).

The late 1800s and early 1900s were marked with much progress in female suffrage. As females progressed towards an equal social status, they appeared in many career fields. As is much in the history of education, the needs of the business world dictated the procedures in the schools. Industrial and technological developments required more and better trained personnel than the male population could supply (Solomon, 1985, p. 157).

The social and political upheavals worldwide in the 1910s and 1920s created a youthful and rebellious generation in the 1920s. Females in this period carried forward the feminist traditions of the previous generation and were fully aware of their new social status (Solomon, 1985, pp. 157-158).

In the 1930s, educators became increasing concerned with the impact of sexual relations on the education of females. Many thought that any heterosexual response was driving the female back into the domestic mold and stifling her independence. Media coverage of the philosophy of Freud greatly interested educators. The study of human behavior grew and became more of a formal science than a philosophy. Regulations governing the social behavior of males and females grew in number as educators attempted to ensure an effective and proper education for all students (Solomon, 1985, pp. 162-164).

The Second World War greatly increased the presence of females in the work force. To support this movement, the education of females grew. Females quickly equated the advantage of education to obtaining a better paying job. However, the American male public still did not fully accept the idea of a female "taking a job away" from a male. Furthermore, much public opinion was against the employment of mothers and wives, people who should be at home with their families. Even many social reformers considered that a separation must exist between females who were pursuing careers and females who intended to marry and have children (Solomon, 1985, p. 175). According to education reformist Ethel Puffer Howe, educators did a poor job in providing females with guidance on how to balance a family and a career. Virginia Collier made a popular report in 1926 concerning the few females who were successful in both family and career. Her report spurred a number of similar research studies through the mid 1940s. By 1940, the idea that a female had some degree of control over her future had begun to spread in the U. S. (Solomon, 1985, pp. 176-185).

People who suffered through the Depression of the 1930s and then celebrated the military victories of the 1940s, began the 1950s with a hopeful view of a future full of expansion and growth. However, many of the advancements made by females in the 1940s were lost in the 1950s as peaceful times once again brought on the debate of a female's place in society. Also, the G. I. Bill blocked many females from gaining education. The flood of males returning from the War coupled with the promise of easy Federal money enticed many colleges to strongly favor male war veterans. Even some traditional female colleges began to accept males.

Continuing into the early 1960s, rapidly expanding business and economic opportunities gave females a much better chance to follow a career decision. The 1960 census showed that "women accounted for sixty-five percent of the increase in the labor force between 1950 and 1960" (Solomon, 1985, pp. 194-195). In the early 1960s, approximately sixty percent of the college educated females and forty percent of the high school educated females were employed in the labor force. Educators, however, still did not address the issue of a female combining a family and a career.

The social changes begun in the late 1960s and continuing into the present led to the formation of major movements concerned with female equality. One aspect behind the success of these movements is that females expanded their ability to work together as a force rather than attempting to achieve success on an individual basis (Perl, 1978, pp. 199-205; Solomon, 1985, p. 195). Whether recognizing trends and needs in the labor force or for moral and ethical reasons, the government stepped into the debate by including gender as a factor in the discrimination laws of the 1960s and 1970s. Backed by Federal law, today's education and employment of females continues to move forward towards the goal of equality in education, employment, salary, respect, opportunity, and individual freedom.

Workplace Requirements of Today

The traditional U. S. work force has consisted primarily of males. The white male has long been considered the mainstay of the economy. However, white males will contribute only fifteen percent of the new work force between the years 1985 and 2000 (Everybody Counts, 1989, p. 18). It is vital that females be a part of the work force of the future if it is to be adequately staffed (National Science Foundation, 1992, U. S. Congress, Office of Technology Assessment, 1988a, 1988b, and Vetter, 1990 (as cited in Clewell, Anderson, and Thorpe, 1992, p.1)).

The role of females in the American workplace has expanded significantly in the past twenty-five years. The number of females working outside the home rose from thirty-nine percent to forty-five percent between 1972 and 1986. By the year 2000, eighty percent of the females between twenty-five and fifty-four years old will be employed, and overall, females will compose almost one-half of the total work force (Bartholomew and Schnorr, 1991, p. 2).

Technology continues to grow ever more important in today's world. No longer applicable to just science and mathematics careers, mathematics is an important and critical part of any career (Everybody Counts, 1989, p. 1). Over seventy-five percent of all jobs today require proficiency in simple algebra and geometry, either as a prerequisite or as part of a licensing procedure (Everybody Counts, 1989, p. 4). The importance of mathematics in the future workplace cannot be under-emphasized. However, there has been a general decline in the number of people who are capable of working in mathematical and science careers (National Academy of Sciences, 1987, National Research Council, 1991, U. S. Congress, Office of Technology Assessment, 1988a, 1988b, and Vetter, 1990 (as cited in Clewell, Anderson, and Thorpe, 1992, p.1)). Further exacerbating the problem is the fact that females are greatly under-represented in fields involving mathematics (Boswell, 1985, in Chipman, Brush, and Wilson, 1985, p. 175; Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 225-226).

Some recent research indicated that post high school employment experiences had grown similar for both male and female graduates (Levine and Edgar, 1994, pp. 282-300). However, gender bias still occurs in various aspects of today's workplace. Females are still excluded from certain careers. Females are also precluded from advancing to the highest positions in some organizations (from breaking the so-called "glass ceiling"). Finally, females may receive less pay for the same job as compared to males (Bartholomew and Schnorr, 1991, pp. 2-3). The impact of these biases must be considered in the education of females. Teachers, administrators, and counselors must be conscious of social biases in order to give female students the proper education and guidance that will allow them an equal opportunity in their future. The disparity between females and male in the workplace is slowly shrinking, but still exists (Ferber, 1987, pp. 4-22). Female students must be given the education necessary for them to enter the work force with a strong background that will allow them to compete and overcome any social bias that they might encounter.

Today's Education of Females

In the past twenty-five years, the female movement has brought about a number of significant changes in both law and social custom. A most notable step forward towards equality in education was the passage of Title IX, enacted as part of an educational amendment in 1972. This law prohibited sexual discrimination in any educational program receiving federal financial support. The implementing regulations for Title IX appeared in June, 1975, and demanded that educators carry out the Title IX requirements.

Despite the efforts since the enactment of Title IX, sexual discrimination and gender bias still occur in today's schools. This discrimination can be a result of a number of factors. Parental influence, teacher influence, peer influence, and the educational environment can all influence the female student. These influences can be directed at the worth of mathematics, the worth of females, or the worth of females in mathematics (Boswell, 1985, in Chipman, Brush, and Wilson, 1985, pp. 175-176; Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 245-247). These influences can be summarized as external structural barriers such as bias in education or business communities, social pressures from family and friends, and internal barriers such as the student's own opinion about self-worth and ability in mathematics (Boswell, 1985, in Chipman, Brush, and Wilson, 1985, p. 176). This study attempted to focus on a potential environmental influence, or external barrier, affecting the selection of female honors mathematics students at Kempsville Middle School.

Environmental barriers can cause a conscious or sub-conscious effect that teaches that females are not as important, as smart, or as worthy as their male counterparts, and that males are the only ones who are capable of succeeding in the world. Males tend to dominate in many classrooms, and teachers are often more likely to praise the male for good work than for a similar effort by a female. Male outbursts are more often overlooked by a teacher. Teachers are often completely unaware that they are behaving in this biased fashion, and subsequently, are unaware of the subconscious messages that they are sending (Boswell, 1985, in Chipman, Brush, and Wilson, 1985, pp. 175-179; Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 245-247; Sadler and Sadler, 1994 (as cited in McDowell, 1994, p. E11)).

Males and females show little difference in mathematical ability, effort or interest until the adolescent years when course selection and career choices begin to influence student efforts and results (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94; Casserly and Rock, 1985, in Chipman, Brush, and Wilson, 1985, pp. 225-226; Chipman and Wilson, 1985, in Chipman, Brush, and Wilson, 1985, pp. 275-328; Clewell, Anderson, and Thorpe, 1992, p. 9; Czujko and Bernstein, 1990, p.5; Everybody Counts, 1989, p. 21; Granstam, 1988, p. 6; Stalling, 1985, in Chipman, Brush, and Wilson, 1985, pp. 222-223). A lack of emphasis on mathematical courses affects future college and career decisions. The decisions made in the early middle and high school years affect the opportunities available in later years (Clewell, Anderson, and Thorpe, 1992, p. 9; Fox, Brody, and Tobin, 1985, in Chipman, Brush, and Wilson, 1985, pp. 249-250; Husher, 1993, pp. 15-16).

This decline in interest and performance begun in the middle school years carries on through college. Females who maintained their mathematics studies in middle and high school today enter college with approximately the same preparedness as males (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94; Brush, 1980, p. 3; Everybody Counts, 1989, p. 22). However, females do not maintain this equality throughout the college years. Forty-six percent of mathematic baccalaureates go to females, but only thirty-five percent of the master's degrees and seventeen percent of the Ph.D. degrees in mathematical sciences go to females. Females receive approximately one-third of all science and engineering degrees; however, the highest percentages of females appear in those sciences requiring the least mathematics (psychology, biology, and sociology) and the lowest percentages of females appear in those careers requiring the most mathematics (engineering, economics, geoscience, and chemistry) (Everybody Counts, 1989, p. 22).

The gender gap in mathematics grows with continued exposure in family, school, and society to the accumulating effects of gender-role experiences. The gap widens as the female student is confronted in middle school, high school, and college with more of society's expectations (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94; Everybody Counts, 1989, pp. 22-23; Stalling, 1985, in Chipman, Brush, and Wilson, 1985, pp. 222-223).

Research indicates that subject interest is as important, if not more, than ability in the analysis of why females do or do not continue in mathematical studies for as long a period as males (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94; Stalling, 1985, in Chipman, Brush, and Wilson, 1985, pp. 222-223). Another research finding is that special programs for the advanced mathematical female student have significant positive impact on course selection and personal plans. Furthermore, attitudinal and interest measurements on seventh graders indicates that mathematically capable boys and girls have very similar interests, much more than in past generations (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94; Chipman and

Wilson, 1985, in Chipman, Brush, and Wilson, 1985, pp. 275-328; Dickens and Cornell, 1993, pp. 53-73; Fox, Brody, and Tobin, 1985, in Chipman, Brush, and Wilson, 1985, pp. 249-274; Stalling, 1985, in Chipman, Brush, and Wilson, 1985, pp. 222-223).

The middle school years are a crucial point in the education of any student for a number of reasons. Middle school course selection and student performance determine the general academic track of the student (which, in turn, determines access to mathematic and science courses, and therefore higher career courses). Also, it is during these years that female participation in mathematics and science has been documented to begin to decline. Third, these are years of major social and behavioral changes in the student. Middle school intervention must be a balanced approach between skills awareness and career awareness (Clewell, Anderson, and Thorpe, 1992, pp. 15-16, 23).

Educators today motivate the female student by focusing on one or all of the following factors (Fox, Brody, and Tobin, 1985, in Chipman, Brush, and Wilson, 1985, pp. 249-251; Stalling, 1985, in Chipman, Brush, and Wilson, 1985, pp. 222-223):

encouragement,
career education,
social education,
exposure to positive role models,
single-sex classes,
early experiences for the gifted in mathematics,
access to special school programs, and
support from family and teachers.

A more aggressive approach can involve an intervention program that is composed of one or more of the following elements (Clewell, Anderson, and Thorpe, 1992, pp. 12-13):

separation from regular school efforts,

sensitivity to the needs of females,

innovative instructional techniques and equipment,

focus on just one subject (mathematics or science),

activities that are more than achievement oriented, and

multiple strategies to achieve goals.

It is imperative that females be presented mathematics in a positive and encouraging fashion. Not only must the teacher present no bias, the student must perceive no bias. The teacher must be completely aware of the presence or perception of bias and its effects (Armstrong, 1985, in Chipman, Brush, and Wilson, 1985, pp. 91-94). The teacher must be alert to precisely what is being said or read. The teacher must be alert to the reactions in the classroom. The teacher must be alert to the testing and grading of the students. The teacher must be conscious of fair selection for all school programs. The teacher need not slant towards females in the class, but rather the teacher needs to be conscious that males and females are all being fairly treated.

Summary

The traditional beliefs that females were incapable of learning and should concentrate only on household duties have slowly been destroyed. The economical necessities of the last century have demanded that females be educated to move into the work force. Also, precise research has demonstrated that females and males both have similar learning capabilities and potentials.

In the field of mathematics, male and female students show equal ability, all else being the same. However, environmental, social and internal influences may drive the female student away from continuing mathematical studies. Attitude and interest are far more predominant than ability in a female's decision concerning a mathematical career.

The work force of the future demands that females contribute to the field of mathematics. Major corporations and numerous girl's organizations have already taken steps to motivate middle and high school females to continue their studies in mathematics and science. Educators are joining in this effort. There are not enough white males in the work force and not enough white males potentially able to enter the work force in the near future to justify any irrational biases against females.

CHAPTER III

METHODS AND PROCEDURES

This chapter covers the methods and procedures used in this research study. Included in this chapter are sub-sections on population, instrument design and use, methods of data collection, statistical analysis, and a final summary.

Population

This study was divided into two parts. The first part of this study was to determine a correlation between the gender of seventh and eighth grade students at Kempsville Middle School and their assignment to honor mathematics classes as an indicator of gender bias in mathematics classroom assignment. The population for this part of the research study was the entire mathematics enrollment of the seventh and eighth grades at Kempsville Middle School. The total number of students in both grades was 834.

The second part of this study was an interview of the personnel involved with the honors mathematics selection process at Kempsville Middle School to precisely identify the honors selection process and to review it for gender impartiality. The population for this part of the study consisted of the four sixth grade mathematics teachers (the people that select seventh grade honor students) and the four seventh grade mathematics teachers (the people that select the eighth grade honor students).

Instrument Design and Use

The first part of this study used no instrument. The second part of this study involved a simple guide for the interview of selected teachers concerning the steps taken to select someone for the honors mathematics course. This guide was an outline of questions to be used to ensure that each teacher was asked the same basic core of questions.

Methods of Data Collection

The data concerning the first part of the study was collected from the enrollment printouts for each seventh and eighth grade mathematics class at Kempsville Middle School. These enrollment sheets were obtained with the permission of Mr. C. Austin and printed by Mrs. J. Lee, both of the Guidance Office. Using these enrollment sheets, it was possible to determine the number of females in both the core and the honors mathematics courses. The actual enrollment printouts are presented in Appendix A.

The data concerning the second part of this study was obtained by interviewing a sample of the mathematics teachers who select the seventh and eighth grade honor students to determine the selection process. Two of the four sixth grade and two of the four seventh grade teachers were selected at random for the interview process. The teachers in question were stratified male and female and then chosen randomly using a "draw from the hat" procedure. The sixth grade teachers select the seventh grade honor students, and the seventh grade teachers select the eighth grade honor students. The purpose of this interview was to outline the overall selection process and to note any potential areas where gender bias could or had been inserted. The guide used in this part of the study is located in Appendix B.

Statistical Analysis

Basic statistics were used to analyze the data obtained in the first part of the study to develop a profile of each class. This data was then analyzed to obtain overall percentages of females in the general population, the core classes, and the honors classes. The second part of the study was an objective review of statements made by teachers and involved no statistical analysis.

Summary

The data used in the first part of this study was obtained from the enrollment records of the seventh and eighth grade mathematics classes at Kempsville Middle School. The data was analyzed using basic statistics to determine the percentages of females in the seventh and eighth overall populations, as well as the specific core and honors populations.

The data used in the second part of this study was obtained by interviewing a sampling of the sixth and seventh grade mathematics teachers. This process was to determine the overall selection process and involved no statistical analysis.

CHAPTER IV

FINDINGS

This study was composed of two parts. The first part of this study was to determine a correlation between the gender of seventh and eighth grade students at Kempsville Middle School and their assignment to honor mathematics classes as an indicator of gender bias in mathematics classroom assignment. Data was collected in February of the 1994-1995 school year. The second part of this study was an interview of the personnel involved with the honors mathematics selection process at Kempsville Middle School to precisely identify the honors selection process and to review it for gender impartiality.

The data obtained in the first part of this study is presented in the first sub-section of this chapter in a series of tables. The final analysis is also presented in a graphic format. The selection procedure and comments obtained in the second part of this study are presented in the second sub-section of this chapter. There was no statistical analysis performed in this part of the study. Rather, it is an overview of the general selection procedure. A summary concludes this chapter.

Enrollment Data

All of the data in this sub-section was obtained in February of the 1994-1995 school year at Kempsville Middle School. The data was obtained from a review of the enrollment printouts for each of the seventh and eighth grade core and honors mathematics classes. The enrollment printouts were obtained from the school's Guidance Office and are enclosed in Appendix A.

Table 1 presents the raw data of the population in the seventh and eighth grade noting those students in the overall, core and honors mathematics classes for each teacher.

Table 1

Kempsville Middle School Seventh and Eighth Grade Mathematics Classes Populations Raw Data

Seventh Grade (Class(Core or Honor) / Male / Female / Total)

Teacher	C / M / F / T	C / M / F / T	C / M / F / T	C / M / F / T
#1	C /11 /10 /21	C /11 /12 /23	C /13 /13 /26	H /14 /17 /31
#2	C /09 /18 /27	C /09 /17 /26	H /14 /14 /28	H /11 /15 /26
#3	C /08 /18 /26	C /15 /10 /25	C /11 /14 /25	H /13 /13 /26
#4	C /15 /11 /26	C /09 /18 /27	H /13 /15 /28	H /09 /17 /26

Eighth Grade (Class(Core or Honor) / Male / Female / Total)

Teacher	C / M / F / T	C / M / F / T	C / M / F / T	C / M / F / T
#1	C /17 /12 /29	C /12 /12 /24	C /10 /13 /23	H /07 /25 /32
#2	C /10 /11 /21	C /14 /09 /23	C /08 /13 /21	H /09 /19 /28
#3	C /17 /11 /28	C /13 /15 /28	C /19 /09 /28	H /10 /17 /27
#4	C /15 /10 /25	C /18 /10 /28	C /12 /17 /29	H /18 /05 /23

Table 2 presents the summation of each class regardless of teacher.

Table 2

Kempsville Middle School Seventh and Eighth Grade Mathematics Classes

Populations Summary

Seventh Grade (Male / Female / Total)

Core	Honors	Overall
111 / 141 / 252	074 / 091 / 165	185 / 232 / 417

Eighth Grade (Male / Female / Total)

Core	Honors	Overall
165 / 142 / 307	044 / 066 / 110	209 / 208 / 417

Table 3 is a summation of the population presented in a percentage format.

Table 3

Kempsville Middle School Seventh and Eighth Grade Mathematics Classes

Populations Percentage Summary

Seventh Grade (Female Percentage of Population)

Core	Honors	Overall
56.0%	55.2%	55.6%

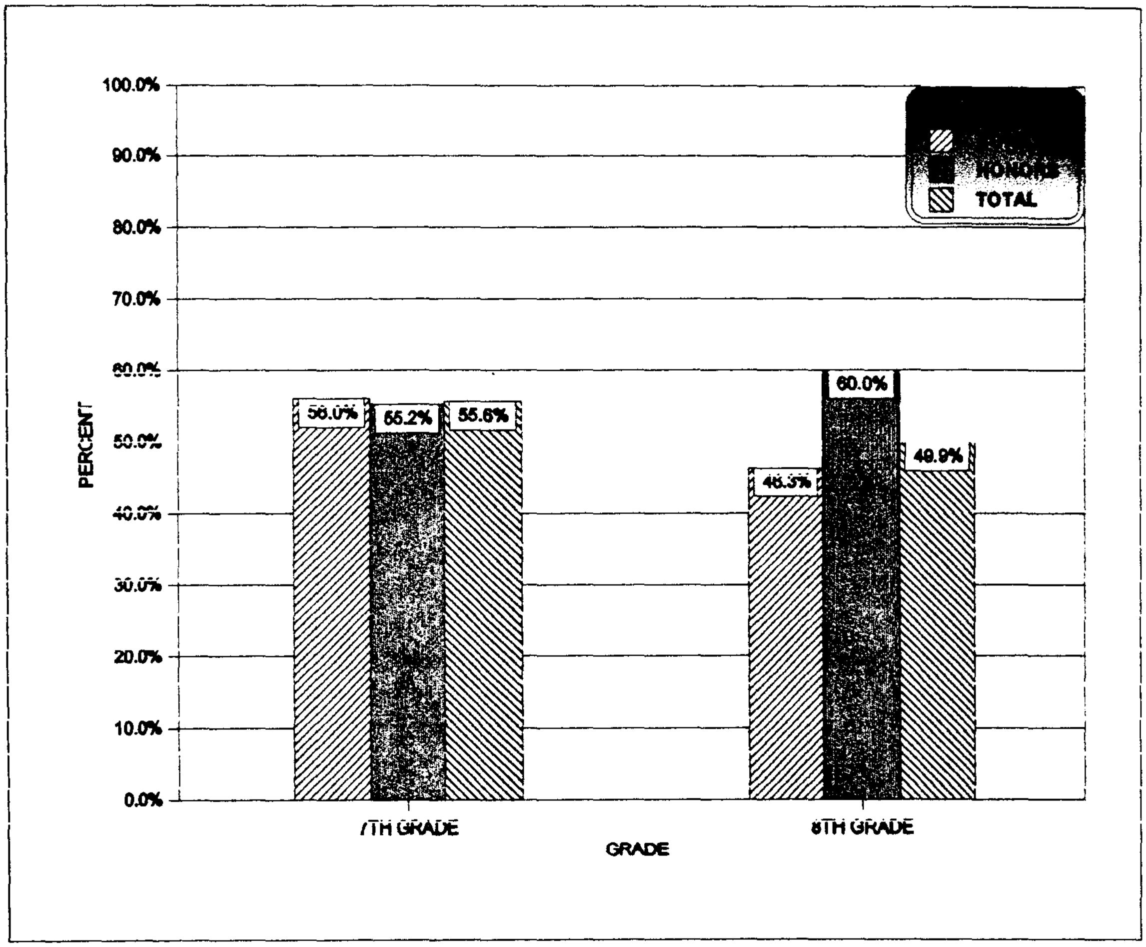
Eighth Grade

Core	Honors	Overall
46.3%	60.0%	49.9%

Figure 1 is a graphic representation of the data in Table 3.

Figure 1

Kempsville Middle School Seventh and Eighth Grade Mathematics Classes Female Populations Percentage Summary



Selection Process Data

The interviews of two of the four sixth grade teachers (the people who choose the seventh grade honors students) and two of the four seventh grade teachers (the people who choose the eighth grade honors students) revealed the basic selection procedure. The guide used to interview a sampling of these teachers is enclosed as Appendix B.

In sixth grade, all students are in the same type of class. There is no ability grouping (in other words, no core or honors class) in this first year of middle school because of the variety of teaching styles and philosophies in the elementary schools from which the students come. During the middle of the sixth grade, the teacher will administer a departmental computation test to determine the proficiency of the student at performing basic elementary arithmetic functions. The teacher will select candidates for honors seventh grade mathematics based on test performance and overall mathematics grades. Parents are notified of the teacher's recommendations. The parents have the final approval in this decision.

In the seventh grade, each seventh grade teacher has the ability, with parent's permission, to move students to or from the honors class as deemed appropriate. This allows for corrections in the assignment of students who went unnoticed or who were unable to perform well in the sixth grade.

In the seventh grade, the decision to assign a child to the eighth grade honors class is begun by administering a department generated computation test to all students in the seventh grade honors class. This exam is given to measure basic elementary level arithmetic skills. Historically, the screening cutoff has been at 35 of 40 questions (87.5% or a B-). Also, the Orleans-Hanna algebra comprehension test is administered. Historically, the screening cutoff for this second test has been at 80 of 98 possible points. Both of the tests are right/wrong tests with no opportunity for extra credit. A letter is sent to the parents of each student listing the scores of the above tests along with the student's current grades and a recommendation for either core or honors eighth grade mathematics. Again, the parent has the final approval in this decision. Historically, approximately sixty percent of the seventh grade honor students make the selection for eighth grade honor mathematics course. Of note, each teacher reviews their regular seventh grade core class for the A student who might have the potential to pass the honors screening. These special cases are given the same screening as the honor students.

Comments from each of the teachers interviewed stressed that the selection for both the seventh and eighth grade honors class centered on performance. Also, each teacher commented that the parent has the final decision in the selection process. No comment was made concerning any other factor.

Summary

The research problem of this study was to determine if gender bias existed in the selection of females for the honors seventh and honors eighth mathematics courses. In a numerical review of the present populations of the seventh and eight grade honors classes, it was found that females comprised 56.0% of the seventh grade core mathematics classes, 55.2% of the seventh grade honors mathematics classes, and 55.6% of the overall seventh grade class. Also, it was found that females comprised 46.3% of the eighth grade core mathematics classes, 60.0% of the eighth grade honors mathematics classes, and 49.9% of the overall eighth grade class. An interview with a sampling of the teachers who conducted the honors mathematics screening process indicated that the selection for seventh and eighth grade honors mathematics class was determined by a review of classroom grades and performance on special tests. A computation skills test was used in the screening for both seventh and eighth grade honors mathematics. An additional algebra comprehension test was used in the screening for the eighth grade honors mathematics class. Classroom grades and test results were reported with a recommendation to the parents who had the final decision in the selection process.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter includes a summary, conclusions, and recommendations concerning this research study. The summary sub-section is a overview of the first four chapters of this report. The conclusions sub-section is a list of the answers to each of the research goals in light of the findings. The recommendations sub-section is a list of proposed ideas for future research consideration.

Summary

The problem of this study was to determine a correlation between the gender of seventh and eighth grade students at Kempsville Middle School and their assignment to honor mathematics classes as an indicator of gender bias in mathematics classroom assignment.

The findings were collected through a review of the enrollment data in the seventh and eighth grade mathematics classes at Kempsville Middle School collected in February of the 1994-1995 school year. Also, an interview of a sampling of the teachers involved in the screening of students for the honors classes was conducted to reveal the steps in the selection process.

The study was centered about the following research goals.

1. To identify the percentage of females enrolled in the general population of the seventh and eighth grades at Kempsville Middle School.
2. To identify the percentage of females enrolled in the seventh and eighth grade honors mathematics courses at Kempsville Middle School.

3. To determine if a significant difference exists between the percentages determined in objectives one and two above.

4. To interview the personnel involved with the honors mathematics selection process at Kempsville Middle School to precisely identify the honors selection process and to review it for gender impartiality.

This research paper was limited to the current seventh and eighth grade enrollment at Kempsville Middle School, not including special education students, due to the limited access to, and limited quantity of enrollment data.

Assumptions made during this study were that the enrollment records of the administration personnel and the teachers of the classes in question at Kempsville Middle School were complete and accurate; that no major exodus of female students to private or home schools had occurred because of the selection policy; that the review of all seventh and eighth grade mathematics classes negated any abnormality that could be injected by the review of just a single teacher; that male and female students had the same capability to accomplish the subject material; that no outside force (e.g., parents, church) was acting on the children to prevent female students from working at their potential; and that the number of students in special education classes, who were not considered in this study, would not skew the results of the study.

A review of the literature associated with this topic revealed that the suppression of females in education, and subsequently in the work force, has been the norm throughout much of history. Over the past seventy-five years, the changes in the structure of the work force caused by technological advances coupled with the social and political advances made in the women's movement have enabled females to move in far greater numbers into a larger variety of careers. This increase in representation in the work force has been reflected in much improvement towards the full education of females. Today, most females receive their basic education side-by-side with males. However, the traditions of past Western societies and cultures still inject gender bias into various aspects of education and the business world. Many educators today expend much effort to ensure that females receive an unbiased education that will best enable them to compete in the world of the future.

This research study focused on the mathematics honors selection procedure at Kempsville Middle School. Data was obtained concerning the male and female enrollment in the seventh and eighth grade mathematics classes, and percentages were calculated reflecting the female representation in the different classes of each grade. Also, a sampling of teachers were interviewed to determine the exact selection procedure.

Conclusions

Based on the findings discovered in this study, the following conclusions may be made concerning each of the research goals.

1. To identify the percentage of females enrolled in the general population of the seventh and eighth grades at Kempsville Middle School.

The findings revealed that there were 232 females of 417 students overall in the seventh grade class comprising 55.6%. Also, there were 208 females of 417 students in the eighth grade class comprising 49.9%.

2. To identify the percentage of females enrolled in the seventh and eighth grade honors mathematics courses at Kempsville Middle School.

The findings revealed that there were 91 females in the honors class of 165 students in the seventh grade class comprising 55.2%. Also, the findings revealed that there were 66 females in the honors class of 110 students in the eighth grade comprising 60.0%

3. To determine if a significant difference exists between the percentages determined in objectives one and two above.

In the seventh grade, the percentage of females in the honors class was approximately equal to the overall percentage of females in the general seventh grade mathematics class population. In the eighth grade, the percentage of females in the honors class was higher than the overall percentage of females in the general eighth grade population. No gender bias was apparent in the selection process results.

Appendix C offers a different and more involved analysis of the raw data. It also concludes that there is not a gender bias acting as an environmental barrier in the selection of females to the honors mathematics courses at Kempsville Middle School.

4. To interview the personnel involved with the honors mathematics selection process at Kempsville Middle School to precisely identify the honors selection process and to review it for gender impartiality.

The interview of teachers involved in the selection process revealed that performance was the key factor in determining selection for both the seventh and eighth grade honors mathematics classes. Students were given special tests to determine their mastery of elementary skills. The results of these tests coupled with class grades were used to select students for the honors courses. Parents had the final approval over the assignment. It was evident from the extensive use of tests and grades that performance truly was the key selection criterion. Furthermore, the final approval by parents helped to ensure that no conscious or subconscious bias by a teacher can slip through and interfere with the best education of the female student.

Recommendations

Based on the findings discovered and the conclusions drawn, the following recommendations are offered for future research.

1. An investigation into the guidance and career counseling activities at the school to investigate the relationship between gender and counseling offered concerning future careers.
2. An investigation into the procedures of specific class assignment. The goal would be to determine why some classes are lop-sided in the quantity of males or females. The study should go on to determine if a relationship exists between female performance and the percentage of females in a class.
3. In a study related to item 2, recommend a study investigating if a relationship exists between female performance and a single-sex classroom.
4. An investigation into classroom procedures to determine if a relationship exists between gender and classroom participation.

5. An investigation into classroom procedures to determine if a relationship exists between gender and teacher behavior.
6. An investigation into female performance and the teacher's gender.
7. An investigation into student awareness of past, present and potential future female contributions to various careers. Tied to this study would be a study of methods used to eliminate sex stereotypes concerning females in the work force.
8. An investigation into teacher and counselor stereotypes concerning females in the work force.
9. An investigation to design a special mathematics summer program to refine the mathematics skills of potential female honor students.

BIBLIOGRAPHY

Armstrong, J. M. (1985). A national assessment of participation in the 1960s and its career consequences. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 59-94). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Bartholomew, C. G. & Schnorr, D. L. (1991). Gender equity: Educational problems and possibilities for female students. (Report No. UD 029 131)(Eric Document Reporting Service No. ED 356 305)

Boswell, S. L. (1985). The influence of sex-role stereotyping on women's attitudes and achievement in mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 175-197). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Brush, L. R. (1980). Encouraging girls in mathematics: The problem and the solution. Cambridge, MA: Abt Books.

Casserly, P. L., & Rock, D. (1985). Factors related to young women's persistence and achievement in advanced placement mathematics. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 225-248). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Chipman, S. F., & Wilson, D. M. (1985). Understanding mathematics course enrollment and mathematics achievement: A synthesis of the research. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 275-328). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Clewell, B. C., Anderson, B. T. & Thorpe, M. E. (1992). Breaking the barriers: Helping female and minority students succeed in mathematics and science. San Francisco: Jossey-Bass Publishers.

Czujko, R., & Bernstein, D. (1989). Who takes science? A report on student coursework in high school science and mathematics (Report No. UD 029 131). New York: American Institute of Physics, Education and Employment Statistics Division. (ERIC Document Reproduction Service No. ED 324 237)

Dickens, M. N., & Cornell, D. G. (1993). Parent influences on the mathematics self-concept of high ability adolescent girls. Journal for the Education of the Gifted: The Association for the Gifted, 17(1), pp. 53-73.

Ferber, M. A. (1987). Women and work, paid and unpaid. New York: Garland.

Fox, L. H., Brody, L., & Tobin, D. (1985) The impact of early intervention programs upon course-taking and attitudes in high school. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 249-274). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Freund, J. E., & Simon, G. A. (1992). Modern elementary statistics. Englewood Cliffs, NJ: Prentice Hall.

Granstam, I.. (1988). Girls and women in science and technology education (Report No. SE 052 710). Sweden: Jonkoping University College, Department of Technology. (ERIC Document Reproduction Service No. ED 341 581)

Husher, H. (1993). Closing the gap: Women in technology. Tech Directions, 52(7), 13-22.

Levine, P., & Edgar, E. (1994). An analysis by gender of long-term postschool outcomes for youth with and without disabilities. Exceptional Children: The Council for Exceptional Children, 61(3), pp. 282-300.

McDowell, A. (1994, October 14). Boys, girls get different educations, even in same class. The Virginian-Pilot and Ledger-Star, p. E11.

National Research Council. (1989). Everybody counts: A report to the nation on the future of mathematics education. Washington, D.C.: National Academy Press.

Osen, L. M. (1990). Women in mathematics. Cambridge, MA: The MIT Press.

Perl, T. (1978). Math equals: Biographies of women mathematicians + related articles. Menlo Park, CA: Addison-Wesley Publishing Company.

Robinson. K. (1994, 4 December). New research shows schools cheat girls. The Tallahassee Democrat, pp. 1D, 2D.

Solomon, B. M. (1985). In the company of educated women. New Haven, CT: Yale University Press.

Stallings, J. (1985). School, classroom, and home influences on women's decisions to enroll in advanced mathematics courses. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 199-224). Hillsdale, N. J.: Lawrence Erlbaum Associates Publishers.

Stein, J., & Urdang, L. (Eds.). (1966). The Random House dictionary of the English language (the unabridged edition). New York: Random House.

Woody, T. (1980). A history of women's education in the United States. New York: Octagon Books.

Appendices

APPENDIX A

The following pages are the actual enrollment data sheets used in the first part of this research study.

APPENDIX B

The following is a list of the questions used as a guide in the second part of this research study.

1. What are the steps that you use to select students for the honors mathematics program?
2. Do you edit the list of selectees based on personal opinion of any type?
3. Who has the final decision in the assignment of a student to the honors mathematics program?
4. Are names visible when you grade performance assessments?
5. What is your particular opinion about females in mathematics careers?
6. What articles or books have you read recently concerning gender bias?
7. What input does anyone else on the teaching, administrative, or guidance staff have in screening the list of selectees?

The purpose of this interview is to determine the exact screening process, and to determine any possible entry points for gender bias. This interview is to generate an overview of the process; it is not a series of questions for tabulation or precise analysis.

APPENDIX C

The following pages contain an alternative analysis of the enrollment data measured in the first part of this research study.

Data Description

Table C-1 is a two page summary of the raw enrollment data. The data of each class is listed in a sorted column without regard to teacher. The table displays the seventh and eighth grade core, honors and overall (both core and honors) data broken down into male, female and total (both male and female) categories. For each series of data, basic statistical analysis is presented.

Table C-2 takes the data for the female population out of Table C-1 and summarizes it for mean, median and mode. Percentage of females are calculated for each statistic. A two sample t-test follows the tables.

Figures C-1 and C-2 are graphic summaries of the information in Table C-2.

Summary

This more in-depth analysis of the data taken in this first part of this study revealed the same results as the basic analysis explained in the main body of the report. Whether considering mean, median, or mode, females were properly represented in the honors mathematics class. The two sample t-test shows no statistical difference between the mean female honors and the mean female overall for either grade.

Of note, this more in-depth analysis reflected the effects that a limited amount of data can have on a particular statistic. Mean can be affected by a single class exhibiting extreme characteristics. The extreme characteristic will skew the mean away from a true average of the normal data. Median also can be skewed by a wide spread of a limited amount of data, as shown in the eighth grade honors data. Mode may not be applicable when so little data does not allow for repetition of entries. The overall lesson to learn is that major decisions must not be based on a hasty analysis of just a single statistic in a single class. It is necessary to compute a number of statistics, preferably on a larger amount of data. This is the sort of data that should be saved and analyzed over a long period of time.

TABLE C-1 **KEMPSVILLE MIDDLE SCHOOL 7TH AND 8TH GRADE MATHEMATICS CLASSES POPULATION DATA (CON'D)**

EIGHTH GRADE

CORE

MALE DATA	MALE STATISTICS		FEMALE DATA	FEMALE STATISTICS		TOTAL DATA	TOTAL STATISTICS	
8	MEAN	13.75	9	MEAN	11.83	21	MEAN	25.58
10	MEDIAN	13.5	9	MEDIAN	11.5	21	MEDIAN	26.5
10	MODE	10	10	MODE	9	23	MODE	28
12	VAR	12.39	10	VAR	5.79	23	VAR	9.54
12	STD DEV	3.52	11	STD DEV	2.41	24	STD DEV	3.09
13	MIN	8	11	MIN	9	25	MIN	21
14	MAX	19	12	MAX	17	28	MAX	29
15	RANGE	11	12	RANGE	8	28	RANGE	8
17	SUM	165	13	SUM	142	28	SUM	307
17	NUMBER	12	13	NUMBER	12	28	NUMBER	12
18	CONF(99)	2.617	15	CONF(99)	1.7889	29	CONF(99)	2.2964
19			17			29		

HONORS

MALE DATA	MALE STATISTICS		FEMALE DATA	FEMALE STATISTICS		TOTAL DATA	TOTAL STATISTICS	
7	MEAN	11	5	MEAN	16.5	23	MEAN	27.5
9	MEDIAN	9.5	17	MEDIAN	18	27	MEDIAN	27.5
10	MODE	NA	19	MODE	NA	28	MODE	NA
18	VAR	23.33	25	VAR	70.33	32	VAR	13.67
	STD DEV	4.83		STD DEV	8.39		STD DEV	3.7
	MIN	7		MIN	5		MIN	23
	MAX	18		MAX	25		MAX	32
	RANGE	11		RANGE	20		RANGE	9
	SUM	44		SUM	66		SUM	110
	NUMBER	4		NUMBER	4		NUMBER	4
	CONF(99)	6.2212		CONF(99)	10.8011		CONF(99)	4.7612

OVERALL

MALE DATA	MALE STATISTICS		FEMALE DATA	FEMALE STATISTICS		TOTAL DATA	TOTAL STATISTICS	
7	MEAN	13.06	5	MEAN	13	21	MEAN	26.06
8	MEDIAN	12.5	9	MEDIAN	12	21	MEDIAN	27.5
9	MODE	10	9	MODE	9	23	MODE	28
10	VAR	15.26	10	VAR	22.67	23	VAR	10.46
10	STD DEV	3.91	10	STD DEV	4.76	23	STD DEV	3.23
10	MIN	7	11	MIN	5	24	MIN	21
12	MAX	19	11	MAX	25	25	MAX	32
12	RANGE	12	12	RANGE	20	27	RANGE	11
13	SUM	209	12	SUM	208	28	SUM	417
14	NUMBER	16	13	NUMBER	16	28	NUMBER	16
15	CONF(99)	2.5158	13	CONF(99)	3.0659	28	CONF(99)	2.0829
17			15			28		
17			17			28		
18			17			29		
18			19			29		
19			25			32		

TABLE C-1 KEMPSVILLE MIDDLE SCHOOL 7TH AND 8TH GRADE MATHEMATICS CLASSES POPULATION DATA

SEVENTH GRADE

CORE

MALE			FEMALE			TOTAL		
DATA	STATISTICS		DATA	STATISTICS		DATA	STATISTICS	
8	MEAN	11.1	10	MEAN	14.1	21	MEAN	25.2
9	MEDIAN	11	10	MEDIAN	13.5	23	MEDIAN	26
9	MODE	9	11	MODE	18	25	MODE	26
9	VAR	6.32	12	VAR	11.43	25	VAR	3.51
11	STD DEV	2.51	13	STD DEV	3.38	26	STD DEV	1.87
11	MIN	8	14	MIN	10	26	MIN	21
11	MAX	15	17	MAX	18	26	MAX	27
13	RANGE	7	18	RANGE	8	26	RANGE	6
15	SUM	111	18	SUM	141	27	SUM	252
15	NUMBER	10	18	NUMBER	10	27	NUMBER	10
	CONF(99)	2.0481		CONF(99)	2.7543		CONF(99)	1.5263

HONORS

MALE			FEMALE			TOTAL		
DATA	STATISTICS		DATA	STATISTICS		DATA	STATISTICS	
9	MEAN	12.33	13	MEAN	15.17	26	MEAN	27.5
11	MEDIAN	13	14	MEDIAN	15	26	MEDIAN	27
13	MODE	13	15	MODE	15	26	MODE	26
13	VAR	3.87	15	VAR	2.57	28	VAR	3.9
14	STD DEV	1.97	17	STD DEV	1.6	28	STD DEV	1.97
14	MIN	9	17	MIN	13	31	MIN	26
	MAX	14		MAX	17		MAX	31
	RANGE	5		RANGE	4		RANGE	5
	SUM	74		SUM	91		SUM	165
	NUMBER	6		NUMBER	6		NUMBER	6
	CONF(99)	2.0678		CONF(99)	1.6847		CONF(99)	2.0767

OVERALL

MALE			FEMALE			TOTAL		
DATA	STATISTICS		DATA	STATISTICS		DATA	STATISTICS	
8	MEAN	11.69	10	MEAN	14.38	21	MEAN	26.06
9	MEDIAN	11.5	10	MEDIAN	14.5	23	MEDIAN	26
9	MODE	9	11	MODE	18	25	MODE	26
9	VAR	5.83	11	VAR	8.12	25	VAR	4.73
9	STD DEV	2.41	13	STD DEV	2.85	26	STD DEV	2.17
11	MIN	8	13	MIN	10	26	MIN	21
11	MAX	15	14	MAX	18	26	MAX	31
11	RANGE	7	14	RANGE	8	26	RANGE	10
12	SUM	187	15	SUM	230	26	SUM	417
13	NUMBER	16	15	NUMBER	16	26	NUMBER	16
13	CONF(99)	1.5547	16	CONF(99)	1.8346	26	CONF(99)	1.4004
13			17			27		
14			17			27		
15			18			28		
15			18			28		
15			18			31		

TABLE C-2 KEMPSVILLE MIDDLE SCHOOL 7TH AND 8TH GRADE MATHEMATICS CLASSES ANALYSIS

SEVENTH GRADE

	FEMALE MEAN	OVERALL MEAN	%	FEMALE MEDIAN	OVERALL MEDIAN	%	FEMALE MODE	OVERALL MODE	%
CORE	14.10	25.2	56.0%	13.5	26	51.9%	18.0	26	69.2%
HONORS	15.17	27.5	55.2%	15.0	27	55.6%	15.0	26	57.7%
TOTAL	14.38	26.06	55.2%	14.5	26	55.8%	18.0	26	69.2%

EIGHTH GRADE

	FEMALE MEAN	OVERALL MEAN	%	FEMALE MEDIAN	OVERALL MEDIAN	%	FEMALE MODE	OVERALL MODE	%
CORE	11.83	25.58	46.2%	11.5	26.5	43.4%	9.0	28	32.1%
HONORS	16.50	27.5	60.0%	18.0	27.5	65.5%	NA	NA	NA
TOTAL	13.00	26.06	49.9%	12.0	27.5	43.6%	9.0	28	32.1%

FIGURE C-1

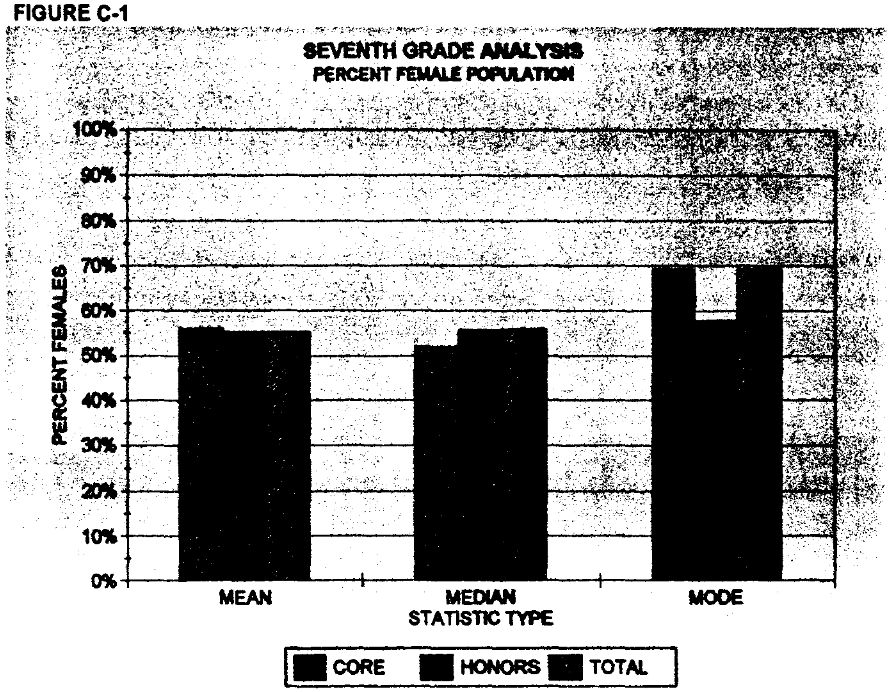
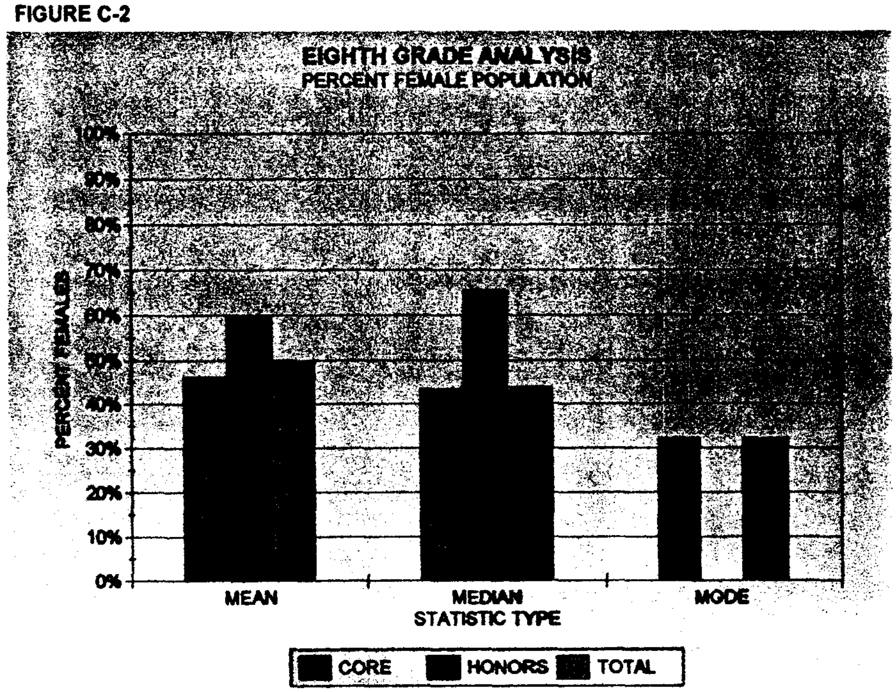


FIGURE C-2



ANALYSIS OF 7TH GRADE DATA - 2 SAMPLE t TEST - PART 1

SAMPLE #1 - 7TH HONORS FEMALE	SAMPLE #2 - 7TH OVERALL FEMALE
N1 = 6	N2 = 16
S1 = 1.41	S2 = 2.85
X1 = 15	X2 = 14.38

N1 AND N2 < 30 IMPLIES SMALL SAMPLE
TWO TAIL TEST REQUIRES DIVISION OF ALPHA BY 2
ASSUME ALPHA = .0100 SO ALPHA/2 = .0050

H0: DELTA EQUALS 0 (U1 EQUALS U2)
H1: DELTA DOES NOT EQUAL ZERO (U1 DOES NOT EQUAL U2)

DEGREES OF FREEDOM = N1 + N2 - 2 = 6 + 16 - 2 = 20
t(.005) AT df OF 20 = 2.845
REJECT H0 IF t (AS CALCULATED BELOW) <-2.845 OR >2.845

$$t = \frac{\bar{x}_1 - \bar{x}_2 - \delta}{\sqrt{\left(\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}\right)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

IF DELTA=0 & OTHER VALUES AS LISTED ABOVE, THEN
t = 1.48 AND FALLS IN ACCEPTABLE RANGE
THEREFORE ASSUME THAT HO IS ACCEPTABLE.
IN OTHER WORDS, THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF FEMALES IN THE HONORS CLASS AND THE AVERAGE NUMBER OF FEMALES IN THE OVERALL SEVENTH GRADE MATH POPULATION.

ANALYSIS OF 7TH GRADE DATA - 2 SAMPLE t TEST PART 2

SAMPLE #1 - 7TH HONORS TOTAL	SAMPLE #2 - 7TH OVERALL FEMALE
N1 = 6	N2 = 16
S1 = 1.97	S2 = 2.17
X1 =27.5	X2 = 26.06

N1 AND N2 < 30 IMPLIES SMALL SAMPLE
TWO TAIL TEST REQUIRES DIVISION OF ALPHA BY 2
ASSUME ALPHA = .0100 SO ALPHA/2 = .0050

H0: DELTA EQUALS 0 (U1 EQUALS U2)
H1: DELTA DOES NOT EQUAL ZERO (U1 DOES NOT EQUAL U2)

DEGREES OF FREEDOM = N1 + N2 - 2 = 6 + 16 - 2 = 20
t(.005) AT df OF 20 = 2.845
REJECT H0 IF t (AS CALCULATED BELOW) <-2.845 OR >2.845

$$t = \frac{\bar{x}_1 - \bar{x}_2 - \delta}{\sqrt{\left(\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}\right)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

IF DELTA=0 & OTHER VALUES AS LISTED ABOVE, THEN

$t = 1.42$ AND FALLS IN ACCEPTABLE RANGE

THEREFORE ASSUME THAT HO IS ACCEPTABLE.

IN OTHER WORDS, THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF STUDENTS IN THE HONORS CLASS AND THE AVERAGE NUMBER OF STUDENTS IN THE OVERALL EIGHTH GRADE MATH POPULATION.

IF THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF FEMALES IN THE HONORS AND OVERALL CLASS, AND THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF STUDENTS IN THE HONORS AND OVERALL CLASS, THEN THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE PERCENTAGE OF FEMALES IN THE HONORS AND OVERALL POPLUATION.

(FREUND AND SIMON, 1992, PP. 324-326)

ANALYSIS OF 8TH GRADE DATA - 2 SAMPLE t TEST

SAMPLE #1 - 8TH HONORS FEMALE	SAMPLE #2 - 8TH OVERALL FEMALE
N1 = 4	N2 = 16
S1 = 8.39	S2 = 4.76
X1 =16.5	X2 = 13

N1 AND N2 < 30 IMPLIES SMALL SAMPLE
TWO TAIL TEST REQUIRES DIVISION OF ALPHA BY 2
ASSUME ALPHA = .0100 SO ALPHA/2 = .0050

H0: DELTA EQUALS 0 (U1 EQUALS U2)
H1: DELTA DOES NOT EQUAL ZERO (U1 DOES NOT EQUAL U2)

DEGREES OF FREEDOM = N1 + N2 - 2 = 6 + 16 - 2 = 18
t(.005) AT df OF 18 = 2.878
REJECT H0 IF t (AS CALCULATED BELOW) <-2.878 OR >2.878

$$t = \frac{\bar{x}_1 - \bar{x}_2 - \delta}{\sqrt{\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

IF DELTA=0 & OTHER VALUES AS LISTED ABOVE, THEN
t = 1.13 AND FALLS IN ACCEPTABLE RANGE
THEREFORE ASSUME THAT HO IS ACCEPTABLE.
IN OTHER WORDS, THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF FEMALES IN THE HONORS CLASS AND THE AVERAGE NUMBER OF FEMALES IN THE OVERALL EIGHTH GRADE MATH POPULATION

ANALYSIS OF 8TH GRADE DATA - 2 SAMPLE t TEST

SAMPLE #1 - 8TH HONORS FEMALE	SAMPLE #2 - 8TH OVERALL FEMALE
N1 = 4	N2 = 16
S1 = 3.7	S2 = 3.23
X1 = 27.5	X2 = 26.06

N1 AND N2 < 30 IMPLIES SMALL SAMPLE
TWO TAIL TEST REQUIRES DIVISION OF ALPHA BY 2
ASSUME ALPHA = .0100 SO ALPHA/2 = .0050

H0: DELTA EQUALS 0 (U1 EQUALS U2)
H1: DELTA DOES NOT EQUAL ZERO (U1 DOES NOT EQUAL U2)

DEGREES OF FREEDOM = N1 + N2 - 2 = 6 + 16 - 2 = 18
t(.005) AT df OF 18 = 2.878
REJECT H0 IF t (AS CALCULATED BELOW) <-2.878 OR >2.878

$$t = \frac{\bar{x}_1 - \bar{x}_2 - \delta}{\sqrt{\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

IF DELTA=0 & OTHER VALUES AS LISTED ABOVE, THEN

$t = .78$ AND FALLS IN ACCEPTABLE RANGE

THEREFORE ASSUME THAT HO IS ACCEPTABLE.

IN OTHER WORDS, THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF FEMALES IN THE HONORS CLASS AND THE AVERAGE NUMBER OF FEMALES IN THE OVERALL EIGHTH GRADE MATH POPULATION.

IF THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF FEMALES IN THE HONORS AND OVERALL CLASS, AND THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE AVERAGE NUMBER OF STUDENTS IN THE HONORS AND OVERALL CLASS, THEN THERE IS NO STATISTICAL DIFFERENCE BETWEEN THE PERCENTAGE OF FEMALES IN THE HONORS AND OVERALL POPLUATION.

(FREUND AND SIMON, 1992, PP. 324-326)