An examination of sex differences in attitude, ability and interest

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AN EXAMINATION OF SEX DIFFERENCES
IN ATTITUDE, ABILITY AND INTEREST

A Project Submitted to
The Faculty of the School of Education
In Partial Fulfillment of the Requirements of the
Degree of
Master of Arts
In
Education: Elementary Option

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San Bernardino, California
1988
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Table of Contents

Abstract ........................................ iii

Acknowledgements ............................... iv

CHAPTER

I. Introduction ................................. 1

II. Review of the Literature ................... 3

III. Statement of the Hypothesis ............... 15

IV. Methodology ................................ 16

V. Findings ..................................... 21

VI. Implications ................................. 31

VII. Conclusions ................................. 34

VIII. Appendix ................................. 36

IX. Bibliography ................................. 41
Abstract

Sex differences in attitude, ability and interest towards mathematics have been investigated. The purpose of this study is to determine if there are statistically significant differences between fourth, sixth, seventh, ninth and twelfth grade males and females in the area of attitudes towards mathematics. The results of the questionnaire given and the statistical analysis of the data collected showed some statistically significant difference between males and females in their ability, attitude and interest. These differences were found in the Success, Male Domain and Confidence attitude scales. The differences found, even though slight, were significant in that they showed a stereotype that may have resulted from the society itself, and not from among the students taking mathematics courses. The findings are in agreement with some of the literature this researcher reviewed. They support the position that the slight differences found may be a result of a new attitude among female mathematicians.
Acknowledgements

First of all, I would like to thank God for His grace and strength He has provided throughout the course of my studies. Next, I would like to thank the Rialto Unified School District for aiding me in my research project. From the administration to the subjects used in my study, the district has been very generous in every aspect possible. Lastly, I would like to thank my family, especially my husband Drew, for his support, encouragement and tolerance during this stretching period of time!
Introduction

Research has shown that there is a dominance of males in the field of mathematics. This predominance shows up and prevails after the early elementary school years. Therefore, the purpose of this research study will be to determine whether or not there exists sex differences in the area of mathematics, in regard to attitude, interest and ability among fourth, sixth, seventh, ninth and twelfth grade males and females. Along with this researcher's work, other studies will also be considered and reviewed. If there are differences found between sexes in the mathematics area, could this perhaps deny one sex the confidence or security needed to excel in the area? If mathematics ability is found to be greater in males than it is in females, then perhaps something is amiss in the education of females. The lack of progress in mathematics for females could be a significant determinant of which college or job for which a female could qualify. This study is designed to measure differences in attitudes, ability and interest between males and females towards mathematics. Therefore, this research study will attempt to uncover facts and reasons why females need to be aided in the mathematics field.
Several questions need to be raised in regard to possible outcomes of this study. These questions would ultimately need to be answered if there are statistically significant differences found between males and females in their attitudes, abilities and interests. One would have to question why females do not excel in this area as males do. Another question raised could be why females do not have as great an interest as males do in the area of mathematics. Furthermore, are mathematics programs in the elementary, junior high school and high school serving the needs of female students? Lastly, if there are differences found, do schools, family members and peers make a concerted effort to encourage females to study mathematics?
REVIEW OF THE LITERATURE

Research has shown that there are two areas to consider in order to understand the males' dominance in the area of mathematics. This means males tend to excel in taking higher level mathematics courses and in choosing a career in mathematics. One area is attitude, which includes ones interest, attitude, environment as well as the society. The other area is ability, which includes actual ability, aptitude and genetic factors. These two areas sometimes overlap with one another in their similarities. However, they also overlap in disagreement. This means that far more research of good design and adequate data exists for attitudes towards mathematics.

Attitude, according to the research, has dominated the reasoning and understanding of why males have prevailed in the world of mathematics. Elizabeth Fennema and Julia Sherman (1977) reviewed 36 studies done since 1974 regarding males' dominance and superiority in mathematics. The results showed no difference between the two sexes until the learners reached upper elementary and junior high school, and these were not statistically significant differences. In addition, males tended to excel in higher-level cognitive
tasks, and females in lower level cognitive tasks. This means males tend to excel in tasks that require processing, perception and judgement. These higher level thinking skills were not as prevalent for females. Therefore Fennema and Sherman did an extensive study of their own. They found minimal differences between males and females. Therefore, the researchers believed that since there was no statistically significant sex differences in mathematics achievement scores until about puberty, the number of females who have equal capability to achieve the same score as males for learning high school mathematics is much larger than the actual number of females who elect to study mathematics in high school and college.

An important factor appears to affect females' electing to study mathematics. This is the societal stereotyping of the learning and usage of mathematics as masculine. Because math is perceived as a male domain, females do not achieve as well and tend not to study math to the same degree as they would if it were seen as a neutral domain. Some of their evidence indicates that females identify mathematics as a male activity. There are several indications that the studying of mathematics is linked to this developing sexual identity, therefore, there is a lack of achievement in this area. Females do not recognize mathematics as an appropriate activity, nor do they recognize the usefulness of mathematics to their long-term, life plans.
Another powerful force that appears to operate differently on boys than girls is parental, according to Aiken. He believes parents perceive mathematics to be more appropriate for boys than for girls. They are reported as buying more mathematics games for boys than girls. In agreement with Fennema and Sherman, Lewis Aiken (1971) consistently found male attitude towards mathematics more positive than females because mathematics is associated with a masculine interest pattern that has developed over a period of several years.

In research done by K. Pedersen, D. Bleyer and P. Elmore (1985) sex role identity implication in mathematics was examined. They used the Fennema-Sherman Mathematics Attitude Scale with junior high school students. These years are important to study because sex role identity becomes more prominent and crucial. Furthermore, important educational choices are made at this stage. The results of the study showed a negative attitude coming from others or from the females taking the mathematics courses themselves. Eighth grade females were less likely to express interest in taking high school mathematics courses than seventh grade males were.

Career interests were also measured in the study by the UNISEX ACT Interest Inventory. This inventory given in 1975, to seventh and eighth grade students consisted of 90 items that assessed interests in the following six area:
business communications; business operations, technology and trade; natural, social and medical sciences; creative and applied arts and social, health and personal services. The study showed significantly higher interest among males than females in mathematics, science and technology trade. Significantly higher interest among females was found in creativity, arts, social, health and personal services and in business communications. Furthermore, attitudes towards academic plans showed that eighth grade females were less likely to take high school mathematics courses than seventh grade females were. The authors concluded, therefore, that these results are representative of the behavioral patterns of about 2500 junior high school students. They support the position that this behavior pattern is culturally induced. They believe junior high school teachers can facilitate the change of negative attitudes toward mathematics and of negative behavior patterns.

Shiam Sharma (1983) a research student in Mathematics Education believes that secondary schools actively contribute to the differentiation of male and female roles by closing off some options to girls by giving them the opportunity to take the courses they want, whether or not their choice is a higher level mathematics course. The researcher believes that neither females nor males should be given any choice of the courses they want to take. By
eliminating this option to "freely choose" the courses one wants, future career choices or performance in mathematics would not be affected. Sharma states that research studies have found a correlation between subject choice and sex. Given free choice, girls show preference for exclusively art based courses. Therefore, it is not unreasonable to suspect that a pupil's subject choice would have direct bearing upon his/her future goals in mathematics.

Henrietta Wexler (1980) believes with other researchers that more women than men have been barred from career advancements because of a lack of mathematics preparation. This lack, Wexler believes, can be attributed to "math anxiety" in women. She reviewed a report from the Educational Commission of the States called "Achievement and Participation of Women in Mathematics; an Overview", 1974. A change in attitudes was found from years 13 to 17. By the twelfth grade girls had taken fewer courses than boys beyond second-year algebra. Thus, boys surpass girls in certain mathematics achievement.

The study found several reasons for girls shying away from the advanced mathematics courses are:

(1) Mathematics has been perceived as a male domain.
(2) The careers girls are encouraged to choose tend not to require advanced mathematics courses as a prerequisite.
(3) Girls do not receive the same encouragement (from parents, teachers, peers and school counselors) as boys to take advanced mathematics courses.

(4) Females lack in their preparation in higher level, advanced mathematics courses.

(5) While both sexes say they enjoy mathematics in about the same numbers, males express more confidence in their mathematics abilities.

* In another research study, Deborah Stipek (1984), tested fifth and sixth graders and their attitudes towards mathematics through pre-test and post-test questionaires. The pre-test questionaires measured students self-perceptions of competence in the mathematics subject matter, as well as their performance expectations on a test to be given. Post-test questionaires assessed students' actual performance, subjective ratings of success or failure, and future performance expectations on tests. Three factors were measured: luck, ability and effort. The results of the study provided evidence that minimal sex differences are found mostly for tasks in which males are believed to be more competent than females at mathematics. The competence questionaire ratings assessed in this study did indicate that boys did rate their mathematics competence higher than girls did. Moreover, girls were more likely to claim that that they did poorly on the test because that particular
test was too difficult for them. Furthermore, the girls were more likely to attribute failure on mathematics tests to lack of ability and less likely to attribute success to ability than boys did.

This leads to the other main area of research that has also dominated the sex differences in mathematics and this is ability. This area includes actual ability, aptitude, spacial ability and genetic factors.

Elizabeth Fennema and Julia Sherman (1977) believe one intellectual area that may be related to mathematics learning is spacial ability and visualization. Spacial visualization and ability, in mathematics terms, means involvement of visual imagery of objects and change or movement in objects themselves. Spacial visualization requires that objects be related, reflected and/or translated. However, these researchers cannot see a clear relationship between spacial visualization and ability. Females do perform at levels that are lower than males on spacial visualization tests and their development of this ability may partially explain females' lower performance in mathematics. However, even the development of spacial visualization skills may be closely related to society's sexual stereotypes. According to Piagetian scholars, all cognitive abilities, including spacial visualization, are developed by interaction with the physical environment. The
play activities of young children are closely linked with sexual stereotypes of what is appropriate. They suggest that boys' interaction with the environment are more likely to involve spacial activities than are girls. Therefore, even if the intellectual area of spacial ability is a determinant of mathematics learning, it may also be related to stereotypic sex-role behavior.

Moreover, Fennema (1974) believes that the most promising intellectual factor that may partially explain boys' mathematics superiority is spacial ability. There is a consensus among many researchers that this is the strongest and most consistent intellectual factor found, although the sex differences in spacial ability is small. It is not, Fennema explains, that there is no concrete evidence why boys' spacial visualization ability becomes more developed than that of girls. However, environment may also influence the development of spacial ability in at least two ways. First, sex stereotypes held by our society, dictate how children should play. Young girls are encouraged to engage in homemaking tasks; whereas, young boys build with blocks, push toy trucks, and engage in athletic activities. Boys activities appear to include more spacial components than that of girls. Thus, teachers may tend to move girls more rapidly from concrete representation to symbolic representation. As a result, girls may lack the concrete experiences that develop spacial ability.
Henrietta Wexler (1980) in agreement with Fennema and Sherman, found in a study "Women in Mathematics," that at age 13, girls do better than boys do in spacial visualization; visualizing shapes and manipulating them abstractly. By grade 12, the girls and boys use the skill equally as well. Yet inferior spacial visualization skills have been cited often as a barrier to womens' success in mathematics achievement or careers requiring mathematics knowledge.

Julian C. Stanley and C.P. Benbow (1980) researched SAT scores of 10,000 gifted and talented junior high school seventh and eighth grade students. They were broken into six different talent groups. Benbow and Stanley drew their data from six talent searches conducted by John Hopkins University since 1972 in six states to identify and help mathematically gifted youth. The greatest difference found by this pair between boys and girls was in the upper ranges of mathematics reasoning ability. Boys outscored the girls 2 to 1. Not one girl earned the top SAT Mathematics score in any of the six talent groups. They observed differences in mathematics reasoning ability up until seventh grade between sexes. Until then, boys and girls presumable had the same amount of formal mathematics training. Therefore, the difference found in mathematics reasoning ability was observed before girls and boys started to differ
significantly in mathematics courses being taken. Thus, taking different courses in mathematics cannot explain sex differences in mathematics reasoning ability.

Researchers Benbow and Stanley (1981) in another article shared their belief that there are differences found in mathematics, not simply because of the advanced courses taken, but because there is a difference in mathematics aptitude. They conclude that boys and girls may score differently on mathematics aptitude tests because there may be a difference in out-of-school activities that have given boys an edge. These activities range from athletics, building with blocks, and pushing toy trucks.

Moreover, Henrietta Wexler (1980) in "Women in Mathematics: An Overview", states that in problem solving when boys and girls are shown to have taken the same mathematics courses through junior high school or high school, tests results show little difference between the sexes in computation and problem solving.

Another aspect, noted by Fennema (1974) is that several researchers have suggested that verbal factors are clearly related to the learning of mathematics. E.E. Maccoby, cited by Fennema, believes that although high performance in verbal factors usually coincides with high performance in mathematics learning, the interaction of sex with the two factors appears unclear. Maccoby concluded in 1966, that
young girls are superior to young boys in verbal ability and that girls learn to read earlier than boys. Throughout the school years, girls do better on tests of grammar and spelling and word fluency. However, by ten years of age, in the verbal area of reading, boys perform as well as the girls do. Boys catch up to girls in reading achievement about the age boys begin to surpass girls in mathematics performance. What, if any, interaction is there between verbal abilities and sex that would affect mathematics? If girls are superior to boys in verbal ability after puberty and if mathematics and verbal ability are closely related, why aren’t girls superior to boys in mathematics? No studies have been found to offer insight into this intriguing question.

A last aspect that needs to be at least mentioned, even though no substantial evidence in studies has been shown, is the genetic factor. Because it appears clear that a problem does exist concerning females’ studying of mathematics, Stafford (1972) has suggested that quantitative ability is transmitted as a recessive characteristic on the X chromosome. If one accepted this hypothesis, it follows that fewer females are inherently as capable as males to learn mathematics. No known data or analysis, however, confirms Staffords’ X-linked recessive hypothesis of the inheritability of the quantitative ability as important at this point.
In summary, a gap has been shown, however slight, between males and females in the area of mathematics performance, interests and attitudes. This gap appears in the upper elementary school years and becomes larger during the junior high and high school years of education. This difference at the present time is not fully explainable, but through the researchers' viewpoints, insights and research done, this difference is being confronted. Researchers continue to seek answers for the apparent sex differences in mathematics attitudes and achievement. Sex differences in mathematics ability appears to be only a myth. A significant amount of research has been done, but none has proved conclusively that males are superior to females in the area of mathematics. The slight difference that does exist in mathematics interest between the sexes is behavioral and not genetic. Therefore with a different upbringing towards mathematics, females could easily reduce the slight difference that does exist. Thus the quest for a definitive explanation continues.
Statement of the Hypothesis

The purpose of this study will be to ascertain whether there will be any statistically significant difference between fourth, sixth, seventh, ninth and twelfth grade males and females in interest and attitude in the area of mathematics.

Null Hypothesis: There will be no statistically significant differences between fourth, sixth, seventh, ninth and twelfth grade males and females in interest and attitude in the area of mathematics at the .05 level of significance.
Methodology

A total of 735 students in the Rialto Unified School District in grades four, six, seven, nine and twelve were given the questionnaire by this researcher. A random sampling of students in each of these grades was identified. The three elementary schools tested were Simpson, Myers and Trapp. Each of these schools is in a different socially and racially integrated area. In the fourth grade population 81 males and 97 females were given the questionnaire. One hundred and eighteen males and 101 females were given the questionnaire in the sixth grade population. At the junior high school level, in the seventh grade 49 males and 42 females, and in the ninth grade 39 males and 26 females were given the questionnaire. Finally, at the senior high school level 41 males and 50 females in the twelfth grade were given the questionnaire.

Simpson Elementary School is geographically located in a middle class area. Many students come from two income families. Simpson has a population of 50 percent Caucasian, 30 percent Black, 15 percent Hispanic and 5 percent of both Filipino and Asian
American. Next, Trapp Elementary School is geographically located in an upper-middle class area. As with Simpson, many students from this area come from a two income family. Caucasians make up 54 percent of the student population at Trapp Elementary School. The other 46 percent is made up of 31 percent Hispanic, 14 percent Black and the other 1 percent is made up of Asian students. The final elementary school tested was Myers Elementary School. Myers is geographically located in a lower class income area. Many of the students come from families on welfare. Racially, Myers has a majority of 57 percent Black student population. The other 43 percent is made up of 27 percent Hispanic, 14 percent Caucasian and the other 2 percent is made up of Filipino, Asian and native American students.

The junior high school tested was Kolb Junior High School. Kolb was chosen because it is geographically located in a middle class area. There were 91 seventh graders and 65 ninth graders tested. The seventh grade classes tested were UGR2, medium level, general mathematics courses. The ninth grade classes tested were UGR3, high level mathematics courses. Kolb’s student population is made up majorly of 49 percent
Caucasians, 25 percent Black, 24 percent Hispanic and the other 2 percent is made up of Filipino, Asian and native Americans.

Eisenhower is Rialto's only senior high school. Thus, every high school student goes to this school. This tenth, eleventh and twelfth grade high school has a racial percentage of 43 percent Caucasian, 24 percent Hispanic, 30 percent Black and the other 3 percent is made up of a combination of Filipino, Asian and native Americans. The twelfth grade classes given the questionnaire were one calculus and two trigonometry/math analysis classes. A total population of 41 males and 50 females were given the questionnaire in the twelfth grade advanced mathematics courses at Eisenhower High School. A tester from the calculus class noted that since Eisenhower opened, in 1963, a consistently even number of females and males have taken advanced mathematics courses.

The purpose of the research study was to ascertain whether or not there existed sex differences in attitude and interest in the area of mathematics. A questionnaire which consisted of 48 questions was created by this researcher. The questionnaire was based on the Fennema-Sherman Mathematics Attitude
Scales. This instrument is entitled An Instrument Designed to Measure Attitudes Towards the Learning of Mathematics by Males and Females (1976). This instrument was the only one available found to be suitable for this study. Eight scales were used with six questions from each of the eight categories. These eight scales consisted of the following categories: confidence in learning mathematics, father, mother and teacher scales measuring perceptions of attitudes towards one as learner of mathematics, attitudes toward success in mathematics, mathematics as a male domain, usefulness of mathematics and mathematics anxiety scale. These questionnaires were given to the principals of the five schools agreeing to give the questionnaire with very precise instructions. Included was a cover sheet for all adults involved, which was an explanation of my research project. Also included was a sheet of instructions for principals and instructions for teachers to read to their students. Furthermore, an optional sheet that was an information and comments sheet was included. (see Appendix A)

Upon completion of the questionnaires by students within a two week period, they were sent to this researcher in an envelope provided. Seventy three per
cent of the questionnaires sent out were returned. The results of the questionnaire were hand tallied by this researcher. They were divided into yes and no answers by males and females.

In this study an attempt will be made to evaluate the data and draw conclusions based on the data. Do there exist differences in male and female attitudes and interests towards mathematics? If so, why do these differences exist. The chi Square and t-statistical tests will be done.
Findings

Upon completion of the hand tallied scores done by this researcher frequency scores were derived. The scores were categorized by gender, grade level and category. The frequency scores were group totals computed into percentages of yes and no answers. The scores were put on an Apple IIe Computer Daisy program in order for statistical tests to be done. The t-test statistical two-tailed tests were done. The chi square statistical tests were also done. Both statistical tests were done to see whether there were similarities or differences between the group scores that were tabulated. Both of these tests were considered plausible for this study. For the t-test and chi square test, the level of significance was set at the .05 level of confidence.

The first half of this study was to determine whether or not there existed statistically significant differences between male and female attitudes. There were statistically significant differences found in five of the eight categories tested (see Table 1).
attitudes scales that tested Usefulness of Mathematics and the Father’s Perception Toward His Child as a Learner of Mathematics both showed statistically significant differences at the .05 level of confidence. The differences showed up between fourth grade males and females.

Another area the attitude scale showed statistically significant differences was in the Success scale. Ninth grade males and females showed differences at the .05 level of confidence. The seventh grade males and females showed some slight differences that should be noted. The differences found here could possibly show that females are very much interested in the success that they encounter within mathematics courses they take. These non-optional courses taken at this particular time of their education may be making some impact upon females. This sign is exciting because females, not only males, are showing interest and concern with their rate of success in mathematics involvement.

Furthermore, statistically significant differences were found at the .05 level of confidence in the Male Domain attitude scale. Differences were found between males and females in both the fourth and sixth grades.
Again the underlying determination implied here by females to overcome the stereotype placed upon them by the society or the opposite sex may be enlightening. The differences found here at the intermediate level in school, according to previous research cited, are said to be about the time when females tend to shy away from mathematics because of the peer pressure. Females do not want males to think that perhaps they are interested in mathematics because it is linked to a masculine characteristic. This consistent, statistically significant differences found at the intermediate level may be a gateway to females disagreement with this perception held by others.

Finally, between male and female attitudes, there were statistically significant differences found at the .05 level of confidence in the Anxiety scale. Differences also exist at the seventh grade level as well as at the twelfth grade level. There was no consistent pattern found in this particular scale. The differences found at the seventh grade level could perhaps be perceived as a struggle of females decision making at this period of time in their life. Perhaps they are not sure whether or not mathematics is a priority at this sex-role identity crisis in their
life. Again, this researcher's viewpoint is no doubt a positive sign of the female's search to find her place in the mathematics arena.

The second half of this researcher's study was to determine whether or not differences exist within genders in their attitudes. Among males there were statistically significant differences in three of the eight attitude scales tested. Among females there were statistically significant differences in five of the eight categories tested.

First of all, there were statistically significant differences at the .05 level of confidence among males (see Table 2). One of the attitude scales that showed differences was the Confidence scale. The differences found in this category were between the fourth and sixth grade males at the .05 level of confidence and between sixth and seventh grade males at the .01 level of confidence. Obviously males in the intermediate grades lack confidence in their attitude towards mathematics ability and interest. As males get older, there is no statistically significant difference. Perhaps the females are finally making an impact in the mathematics area at the junior high and high school levels. Perhaps males are feeling somewhat inadequate as they progress into the upper grades.
Interestingly, females at the seventh and ninth grade level showed statistically significant differences at the .05 level of confidence. This coincides with there being no statistically significant differences shown for the males at this point.

Next, in the Success attitude scale, there were statistically significant differences found at the .05 level of confidence (see Table 3). The differences were found between females at the seventh through ninth grade levels. These differences are interesting because they are only found with the females. This could be because of the presence of a female teacher at the senior high school. At the high school, one of the higher level mathematics courses is taught by a woman. This is an excellent role model for females, and males as well. This should show females that they can be successful and comfortable with a mathematics course or even a mathematics career. This should also show males that females are equally capable and willing to go into higher level mathematics courses.

Furthermore, the Male Domain attitude scale showed some statistically significant differences at the .05 level of confidence. Differences were found between twelfth grade males and between fourth through seventh
grade females. Could it be that females are becoming more liberated and their attitudes changing towards a mathematics movement? Perhaps females are beginning to see that this world and all its options are not for males only, but being a female in today's world is equally as rewarding. Moreover, could females these days, in comparison to the 70's, be not as worried of their sex role identity, or the changing of it? This researcher sees these differences as a positive step of growth in females in mathematics.

Finally, the last category in which some statistically significant differences were found was the Anxiety attitude scale. Differences were found at the .05 level of significance. These differences were between fourth through seventh grade males and seventh and ninth grade females. It seems as though the pressure to perform well in mathematics more consistently lies with males and for a longer period of years. Whereas the females seem to be under pressure during those crucial and constantly changing junior high school years. The differences seem to show that females want to perform better while taking required mathematics courses, which will only motivate them to
take the higher level mathematics courses. These positive differences found are only an encouragement in drawing females into the world of mathematics.
Table 1

Males compared with Females

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T score= number near top  Chi Square score= number near bottom
Males compared with Females

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T score = number near to the bottom

Chi Square score = number near to the bottom
Table 3

Males compared with Females

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</table>

T score = number near top

Chi Square score = number near bottom
Implications

There were few statistically significant differences found between males and females in the area of mathematics attitudes towards interest and ability. This coincides with this researcher's investigation into the work done in this area by others. Males do dominate the field of mathematics. However, the few statistically significant differences present, seemed to imply that females were taking an active part in the mathematics area. The differences that indicate this were found in the Success and Male Domain attitude scales.

It should be noted that a female educator at the high school included in this study teaches a higher level mathematics course. Conversation with her revealed that the higher level mathematics courses have always had about the same number of males and females. She said that this equality has existed since she has been an educator at the school. She has been there since its opening. This educator has been, is and will be, a very positive role model for females.
exposed to her. She will only aide in the recruitment of females into the mathematics courses and perhaps even a career in mathematics. She displays an attitude of confidence for females today that needs to develop more fully in order for females to feel comfortable in this area.

Another point of interest is that females are not as intimidated by males in the mathematics field. As previously noted, females are taking more higher level mathematics courses; in other words, optional courses. This could be attributed to a higher success attitude that is prevailing among females at the present time. The fact that they are feeling such success in their mathematics courses can only draw them into the mathematics arena.

The literature indicated that there is a stereotype prevalent in the society today that seems to intimidate females who want to enjoy mathematics. However, this study showed some differences in the confidence and success attitude scales. Therefore, one could only assume that females are shunning the stereotypes. It is acceptable that females take higher level mathematics courses and achieve to their fullest potential. The peer pressure placed upon females at
the junior high school level does not seem to be affecting the student population studied in this research, as shown in several attitude scales. Hopefully, this will be the rule and not the exception in the near future.

Sex differences, therefore, would appear to be an important, though not necessarily a controlling factor in the furtherance of females into the field of mathematics.
The data used in this study were those available in the public schools. Without a lot of specific background information from student files, there was no indication that any other data exist which would more appropriately indicate the relationship between males and females attitudes towards mathematics interest and ability.

This researcher tested eight different attitude scales at five different grade levels. There was no grade level or any specific attitude scale that showed statistically significant differences all the way across or down any data table.

Mathematics does have bearing on post high school events. Every effort should be made, therefore, to develop and promote elementary, junior high school and senior high school mathematics programs.

The empirical assumption that males are more geared towards mathematics than females and that they are more innately gifted in the field would appear to be mostly myth from the results of this study.
Therefore, the null hypothesis originally stated appears in large part to be correct. Some differences were found but consistent statistically significant differences between males and females were not identified.

Further study is required, however, to determine the answers and hopefully solutions to questions raised by the findings of this study.
Dear Principal,  

November 30, 1987

Please distribute these questionnaires to 3 of your largest mathematics classes. Again, please let these teachers know that this questionnaire should only take a 10-15 minute period. Please have teachers return the completed questionnaires to me in the envelope provided by Friday, December 11th. They can put them through the inner-district mail. Thank you again for your help.

Sincerely,

Mrs. Rose Howse
Teacher, Simpson Elementary School

If you have any questions please call me at extension 7954.
Dear Teacher,

Just for your information, the reason I am giving this questionnaire is to gather data for my Masters Project. My project's subject is "Sex Differences in Mathematics." The questionnaire is an attitude and interest inventory that will show how each person feels about mathematics. It is being given to 4th, 6th, 7th, 9th and 12th grade students in our district. It will not be given to all however, but some. I appreciate the time you will be taking in aiding me in my data gathering!

Sincerely,
Rose House
Instructions for Teachers:

1. Please allow a good 10-15 minutes for students to answer questionnaire.
2. Pass out questionnaire.
3. Read instructions below to students.
4. Encourage students not to ponder on any one statement too long.
5. Answer any questions students may have.
6. Do not lead students to believe this is a test, it is simply a questionnaire.
7. You may help students read and understand any word they may not know.
8. When through with questionnaire, collect, fill out information sheet and return to ROSE HOWSE, Simpson Elementary School in the envelope provided.
9. Thanks again for your time and cooperation!

Instructions to be read to Students: (Please Paraphrase!!!)

1. This is a questionnaire to find out about YOU and Mathematics!
2. At the top, mark an X next to the M if you are a male, mark an X next to the F if you are a female.
3. Fill in the grade level that you are currently in.
4. Answer each statement by marking an X next to the response you choose. Y stands for Yes, N stands for No.
5. Do not take too long on any one statement.
6. This questionnaire will not take you more than 10-15 minutes.
7. When you are through . . . (either have them turn in to you as they each complete the questionnaire, or collect them all at once, whatever is most convenient for you!)
8. You may begin.
9. Have FUN!!!

Information Sheet:

School: ____________________________

Grade Level: _______________________

Course Title: _______________________

Teacher's Name: (optional) _________

Comments: _________________________

_________________________________________________________________

_________________________________________________________________
Male_______ Female_______ Grade Level_______ Questionnaire

1. Y N I can handle more difficult math.
2. Y N My mom thinks I am good in math.
3. Y N My dad thinks math is very important.
4. Y N I would be proud to be the outstanding math student.
5. Y N My teacher has helped me study math more.
6. Y N Math is just as appropriate for males as it is for females.
7. Y N I will need math for my future.
8. Y N Math does not scare me at all.
9. Y N Math is my worst subject.
10. Y N My mom does not like to do math.
11. Y N My dad does not care if I take math courses.
12. Y N I do not like people to think I am smart in math.
13. Y N I have had a hard time getting teachers to talk to me seriously about math.
14. Y N Females in math are kind of man-like.
15. Y N Taking math is a waste of time.
16. Y N Math makes my mind go blank.
17. Y N I am able to get good grades in math.
18. Y N My mom has encouraged me to do well in math.
19. Y N My dad likes to see my math grades.
20. Y N I would be happy to get good grades in math.
21. Y N My teachers think I could do well in math.
22. Y N Females can do just as well as males in math.
23. Y N I study math because I know it is very useful.
24. Y N It would not bother me to take more math courses.
25. Y N I do not think I could do well in math.
26. Y N My mom does not think I could do well in math.
27. Y N My dad thinks math is a waste of time.
28. Y N If I had high math grades I would not care.
29. Y N My teachers think math is a waste of time for me.
30. Y N Females who enjoy math are a bit strange.
31. Y N Math will not be important for my life's work.
32. Y N Math tests scare me.
33. Y N I have a lot of confidence when it comes to math.
34. Y N My mom thinks math is important.
35. Y N My dad thinks I could be good in math.
36. Y N It would be great to be thought of as smart in math.
37. Y N My teachers want me to take all the math courses I can.
38. Y N Males are not naturally better at math than girls.
39. Y N Knowing math will help me make my future living.
40. Y N I am usually very comfortable in my math class.
41. Y N I am not good at math.
42. Y N My mom thinks math is a waste of time for me.
43. Y N My dad does not like math.
44. Y N If I had good math grades, I would try to hide it.
45. Y N My teachers do not talk to me seriously about math.
46. Y N Males are naturally better than girls at math.
47. Y N Math will not be relevant or helpful to my future.
48. Y N Math usually makes me feel nervous and uncomfortable.
Bibliography


