DOCUMENT RESUME

ED 431 522 PS 027 628

AUTHOR Governali, Joanne
TITLE Sex-Role Biases at the Elementary School Level in Mathematics and the Sciences.
PUB DATE 1999-04-18
NOTE 28p.
PUB TYPE Reports - Research (143)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classroom Environment; Elementary Education; *Elementary School Teachers; *Mathematics; Mathematics Education; Science Education; *Sciences; *Sex Bias; Sex Role; Student Characteristics; *Teacher Attitudes; Teacher Student Relationship

ABSTRACT

This study investigated 18 elementary school teachers' awareness of sex-role bias in their classrooms. The teachers taught pre-kindergarten through sixth grade, and were enrolled in an early childhood and elementary education graduate program. Teachers' responses to a questionnaire indicated they were largely neutral in their awareness of sex-role bias against female students, particularly in mathematics and science. Most of the teachers disagreed with the suggestion of greater assertiveness and better math and science achievement among male students and greater verbal skills or confidence among female students. These responses conflict with findings in previous research and even with the teachers' own responses in other areas. Findings suggest the persistence of sex-role bias in elementary schools. Contains 15 references. (JPB)

Sex-Role Biases at the Elementary School Level in Mathematics and the Sciences

Joanne Governali

Abstract

The research in this article addresses socialization factors among the genders. The research mainly focus on female sex-role biases which occur within the educational institutions regarding mathematics and the sciences. A survey was conducted among eighteen early childhood and elementary school teachers in reference to this issue. Many of the participant's responses were neutral which did not agree with the published research findings. In addition, conflicting responses were also noted within the survey. In conclusion, the survey showed that many teachers are unaware of existing female sex-role biases exist within the educational institutions.

Introduction

Males and females are not on equal status levels within education, occupations and professions. It is presumed by society that each gender has the same opportunities for achievement in these areas. Society, in general, has neglected to address sex-role biases among the genders in reference to females. As an educator I am concerned with sex role biases for they underestimate a female's intelligence and abilities. Though gender biases exist within different areas of society, an equal education is an Constitutional right for all children in this country.

I am particularly interested in the biases that effect female students in elementary school in reference to mathematics and the sciences. Approximately, in the fourth grade, females begin to decline in academic achievement in these subject areas. Male's academic performance from this point, advance. Prior, both genders maintained an equal grade level in these subjects, (Weiner-Hirzler, 1980, p.9). Sex-Role biases influence students in regard to their occupational and professional careers. Females are more effected by these biases and choose gender related occupations. The twenty first century will

require a large percentage of mathematicians, scientists and engineers to make up its workforce in this country,(American Association of University Women, 1991, pp.16 & 17).

The information that follows states that females and males are on equal academic grade levels in mathematics and science during their early elementary school years. The levels of achievement in these subject areas do not continue for females. Males progress to advance in mathematics and in the sciences and at the middle school level the differences become significant. Males continue to advance with the complexity in these subjects. The information also stated, for females that were academically high achievers in math and science were less involved with programs that would assist them in extending their achievements in these subject areas, (Banks & McGee-Banks, 1997, pp. 139,149).

A study was conducted at an elementary public school in order to evaluate existing sex biases. Female students attended all female classes. Their academic grade levels were on an equal basis in comparison to males. Cooperative learning was enhanced among the students, positive verbal responses were given by the teacher in reference to their academic achievements and ridicule towards another students academic performance was eliminated. This approach was then applied to an coeducational class. Positive results were shown for both sexes achieved equal grade levels in mathematics and the sciences, (Rhode, 1997, p.59).

At the elementary school level, the grade level of achievement in mathematics and the sciences determines the placement of the students in middle schools. The lower achievers are placed in remedial or introductory courses in mathematics and the sciences, (Weis,1988, p.111). Additional information has supported stereotypical concepts regarding academic subjects and career choices. Chemistry and physics/mathematics, were conceptualized as being male areas. Biology and English

were regarded as female academic subjects and occupations. The studies also noted that these stereotypes pertaining to academic subjects and occupations were not as prevalent during elementary school as they were for middle and high school,(Andre, Whigham, Hendrickson & Chamber, 1997, pp.9 & 10).

Society's Stereotypical Gender Roles

One aspect of this study addresses society's norms of sex-role related occupations. Mathematics, the sciences, and technology are viewed as being male professions. Society's expectations of traditional sex-role related career contributes to the stereotypical choices made by the sexes. The study also noted that both sexes agreed that mathematics and science were subject areas for males. These concepts had begun in the early elementary school grades. A survey done by the Michigan State Board of Education in 1991, also agreed with this concept, (Jewett, 1996, pp.1,7).

Additional information addresses society's expectations in regards to sex-role expectations. Mathematics, the sciences, and technology are considered by society to be male areas. Many females who do enter these academic areas are portrayed by society, and through the media, as being unfeminine and unappealing. These images become inner concerns of young females. This may contribute to one aspect of why females avoid these subject areas, and perhaps this also contributes to a lack of achievement in these subjects, (Fear-Fenn & Kapostasy, 1992, p.3).

The differences in socialization of the sexes, attributes to ability factors. Males do better on spatial problems in comparison to females. Mathematics and science problems may involve spatial abilities. "Spatial skills is the ability to visually manipulate, locate or make judgements about spatial relationships of items located in two-or-three dimensional space," (Frienze, Parsons, Johnson, Ruble, & Zellman,

1979, p.62).

The acquiring of spatial abilities pertains to socialization. In general, males in our society are more involved with the investigating and the handling of the environment. At an early age, males are also involved with mechanical objects/toys during playtime. In addition, males are more likely to experience spatial skills in their everyday lives. It was noted in certain studies that when spatial tasks were practiced there were no sex differences in this ability, (p.63).

Another study is in agreement with males having better spatial visualization skills then females. Also noting that spatial skills are needed in solving many mathematical and science word problems. This ability for males becomes prevalent, approximately, at the beginning of middle school. The research also stated that spatial skills can be easily taught and learned, (Weiner-Hirzler, 1980, p.14).

Parental Influence

The study showed an aspect of how children are socialized regarding sex-role related occupations. These roles are taught and perceived by society in accordance to which gender occupies the role. Children are primarily socialized by their parents and are also influenced by significant others within their environment and society. Careers and professions are thus categorized as being either male or female occupations. Children are also influenced by their parent's concepts of which occupation is appropriate according to the child's gender. The study noted that mother's who held nontraditional sex-role related occupations or were higher educated, were apt to influence their children in nontraditional sex-role related occupations. Children are socialized at an early age, before entering school, in regards to their gender sex-role behaviors. This concept decreases as they get older, but social sex-roles, stereotyping, become enhanced during adolescence, (Davison, 1997, pp.3-6). A number of studies found that

parental influence is significant in adolescents career goals. It was also noted that the students academic achievements correlated to parental interests/involvements in regards to their children's education. In addition, the educational level of the parents and the involvements with their children's education lead to academic majors involving mathematics and science. A longituitial study reported a significant relationship between parental support in the sciences and the students high achievement level in that subject area.

The information provided in the article also addressed the factor of gender encouragements in math and science. Noting, that males are more likely to be encouraged in mathematics and the sciences. Also, there were findings in regards to children's toys. Children usually play with toys according to their gender. It was prevalent in the study that males are geared more in gender typed toys. This may contribute in later years to interests in physics , (Andre, Whigham, Hendrickson, Chambers, 1997, p.11). In this study two different findings were shown. Parents influence their children in academic subjects, their outlooks in these subjects for career choices and attained careers. The most influential aspect of parental influence was not so much as what the parents did for employment, but what the parents verbalized to their children. Adding, that the mother's point of view regarding their daughter's gender role effected the daughter's self-esteem level and their contentment in their adult life. A study showed that females who were in nontraditional vocational training programs were successful when they received emotional support from their parents.

Continuing the study also addressed the fear of success for females. Women with high abilities may hide their competencies if they feel that their social and feminine qualities will be jeopardized. This may be done in order to maintain a positive social existence. Fear of success was also found to be an issue

for feminine women and those who displayed both feminine and male behaviors. The study was conducted with women who had returned to college, and were high achievers but feared success if it entailed social criticism and being viewed as less feminine. In addition, the study also addressed females in the 12th grade in regards to fear of success. The study compared females that had to complete four years of mathematics and those who had to complete less math courses. It should be noted that those with less math courses were competent in this area but did not enroll in the four year math curriculum. The females in the four year mathematics courses were more uncomfortable around males because of their high abilities and they were uncertain and deceptive in regards to their intelligence levels, (Bartholomew & Schnorr, 1991, pp.9&10).

Violation of Gender Roles

A study was done with regard to the modification of gender-roles, social customs and moral rules. The study addressed sex-role biases occurring in a traditional view which enables one to perceive that either sex can and could occupy the same role. For both sexes can engage in the same "activities, occupations and styles of dress," (Levy, 1995, p.516). Also, for one to acknowledge that there are variations of behaviors among all the sexes. In addition, the study included the subject judgements in relation to sex-role biases. For an individual could perceive either sex engaging in the others sex-role behaviors but not be in favor of it.

The subjects in the study were males and females aged four, eight and also undergraduates. The study showed that as the subjects became older they were more acceptable toward crossing boundaries in traditional gender roles. Particularly, they were more acceptable of females engaging in male behaviors. Noting they were less favorable towards males engaging in female behaviors. Their

judgements ere also more negative toward males crossing gender role boundaries such as a male wearing a dress.

In addition, another study was done which included judgements of kindergartners through sixth graders. They stated that it was not wrong for peers to violate gender roles. For males and females could engage in the others behavioral roles. Interestingly, the study noted that their judgements were significantly negative for they would not play with others that did violate gender roles. The children also became more judgmental in this area as they became older. This study noted that females were less judgmental in comparison to males. Females were less critical of males crossing gender role boundaries They were also more inclined to socialize with females that crossed gender role boundaries. The study also noted that individuals perceive sex-roles as being "fixed" and for those that do violate gender roles as being incorrect.

In addition, the study also showed in the traditional sense that there were modifications in social customs and moral rules and these perceptions also increased with age. In comparison, the study showed negative judgements in regards to violating social customs and moral rules and this was in each age group, (pp. 516, 527-529). It consisted of children, ages three through seven. The study addressed children's concepts in relation to gender roles, social and moral norms. The study also included how children perceive opposing these conventions and for children that do.

The study noted that as children became older their concepts in regards to these conventions increased. Adding, that opposing social and moral norms were considered to be the most difficult then opposing gender roles. Opposing moral issues such as stealing was considered to be one the most difficult. Social norms were less difficult to oppose such as improper manners in the handling of food.

It was considered to be more improper to sneeze or cough on another individual.

The opposing of gender roles were the least difficult, though there were certain restrictions involved. Females were more acceptable in comparison to males in regards to crossing gender roles such as clothing/styles and careers. Although both sexes opposed to males having female hairstyles and clothing was opposed to on a lesser basis. It was also acceptable by both sexes for females becoming doctors, but they viewed male nurses negatively. In addition, females that behaved in a rough and tumble manner or if they engaged in mainly male sports were negatively viewed. For males engaging in similar female activities were not negatively viewed, (Blakemore & Owens, 1997, pp.2,5,6,21-23).

Peer Pressure

A study presented several reasons why females do not participate in mathematics, science and technology courses. One reason stated that male peer pressure exists within these classes. It was noted in a vocational school that males express their disapproval toward females in these non traditional educational settings. The disapproval is centered on male domination for the subjects/occupations are not for females, (Fear-Fenn, Kapostasy, Karake, 1997, p.3).

According to society's stereotypical norms mathematics and science are considered to be male domains. Though females may achieve higher academic grades, their lack of self confidence prevents them from pursuing mathematical and science related occupations. Females are more prone to be effected by gender appropriate traditional roles then males. This has been noted by their lack of confidence in achieving a higher education. It has also been noted for females that do enter college in their selection of subject courses taken. The study also addressed the issue that males regard mathematics and the sciences to be male dominate. This assumed premise may prevent females from

engaging in these academic subjects because of male peer pressure. Teachers may also influence females students from persuing mathematics and science subject courses, (Bartholmew & Schnorr, 1991, pp.3-6).

Gender Inequality

The information in this study addresses the higher education attainment of women in this society. Generally, males have a higher level of self confidence, are better able at solving certain problems, and achieve higher academic grades on certain tests. These very issues infringe upon females from passing the necessary tests and national exams which prevents them from entering many higher educational institutions. Females are also at a disadvantage in acquiring scholarships that would assist them in pursuing a higher education, (Rhodes, 1997, p.58).

It has been estimated that by the year 2000 almost half of the workforce in this country will be women, 47%. Prior, in 1987 the mount was 45%. At present, the majority of women that are employed do so out of financial necessity, Yet, the majority of women in this society are still in low paying jobs and are employed in traditional sex-role occupations. Overall, males are on a higher scale of employment, professionally and financially. It should also be noted that discontentment with an individual's employment can effect one's psychological and physical well being. Women that are the sole financial providers of their households are the poorest nation wide. A significant amount of women twenty five years of age and under are the most impoverished. In addition, the majority of occupations held by women will have less expansions in the future, (Bartholomew& Schnoor,1991, pp.2&3).

Lack of Self-Confidence

A study noted that females felt incompetent in comparison to males in the subjects of mathematics

and science. Though the femles achieved equal grades as males, for the differences lied in self confidence. It was also noted, that the lack of self confidence in these subjects slowly increases from the fourth to the beginning of middle school grade levels, (Andre, Shigham, Hendricdson, & Chamber, 1997, p.10).

A study found significant differences in the self-esteem levels between the sexes. (Low self-esteem leads to a lack of self confidence). Females in comparison to males, approximately at the beginning of adolescence, have lower self-esteem levels. Prior, females aged eight and nine years showed to have high levels in this area. For both genders, at the elementary school level, 67% had high self-esteem levels.

During adolescense both genders are experiencing biological and psychological changes. Also, the transaction from childhood into adulthood, and the process of self identity. Though the most significant loss in self esteem for females is between elementary and the middle school years. At the end of adolescence many females leave this period with a poor self image.

Though males experience a loss in self esteem they still maintain a greater sense of competency during this time. The males abilities to accomplish many things adds to their self confidence and this increases with age. In comparison females become more repressed in their abilities to accomplish many things and this increases with age.

In addition, both genders perceive their physical changes during adolescence differently. Males, conceptualize these changes positively for they are physically growing and getting stronger. Females view these changes negatively for they are more directed toward physical appearances. This is also reinforced by how society stereotypes females sense of worth by their physical appearance. During this

time females experience a further loss in self-esteem. Noting that if males are uncomfortable with their physical changes, their abilities in doing many things helps them through this period. Females do not have this inner underlying support system.

At the elementary school level, both genders have positive attitudes and the abilities in the subjects of mathematics and science. The loss of confidence and competency in these subject areas decreases for females as they become older, (American Association of University Women, 1991, pp. 4,6,7,12,13).

This study found relationships in how students perceive mathematics, science, their self image and their career goals. It was noted for students who had substantial interests in these academic subjects, also had higher self-esteem levels, and aspired toward their career goals.

For females, the decline for concern in mathematics and science correlates to the decline in the females self-image. The significant differences between the genders in these findings is how each one conceptualizes these academic subjects. Males view math and science as not being primary concerns, they do not personalize their lack of concern. Females actually feel that they are not intelligent in these areas, for they personalize the reason.

Females during the mid-elementary school years exhibit positive levels of self-esteem and are zealous. Beginning at the early adolescent stage of development females begin to lose self-esteem and their future aspirations. It was noted that females during this time period are highly influenced by negative outlooks. These outlooks consist of society's norms regarding women and its injustices pertaining to women. Their awareness of these issues causes them to oppose these displeasing realities. Adding to the difficulties that female adolescence encounter because of the lack of validity when

addressing these matters. This causes interference for its difficult for them to remain actively intuned with their own insightfullness. These issues lead to females becoming verbally withdrawn, unassertive and a loss in self confidence. In addition, their questions and concerns are not discussed within the classroom because of the time factors involving academic subjects, (American Association of University Women, 1992, 11, 25 & 26).

Education and Student Interrelationships

In general, society's norms regarding the socialization of the sexes exists on an worldwide basis. The different socialization process of the sexes contributes to sex-role conditioning and behavior. This leads to the seperation of attainments in regard to occupations. Society's stereotypical biases in this area influences its members and the roles they are assigned to. Though educational institutions are responsible for education and preparing its society for their adult occupation, overall, society is the main factor that constitutes gender roles and gender biases, (Shamai, 1994, p.665).

"Males are socialized to be autonomous and assertive which contributes to their gender identities. In comparison, females are socialized to be nuturing and to develop interpersonal skills," (Rhodes, 1997, pp.45 & 46). The male role is considered to be dominant in most societies and males maintain their authority in the most significant professions. In contrast, females are considered to be secondary and maintain less important occupations. "Females mainly choose humanistic and domestic sciences and males choose science technology," (Shamai, 1994, p.665).

Addressing one study that took place in Israel in which intervention programs were implemented in a number of schools in order to remove gender stereotypes. The purpose of the study was to discover if females would choose prestigious occupations and also less traditional gender professions. Teachers in

the experimental group had attended workshops which addressed gender stereotypes. The teachers were to transmitt to the students gender equality and also gender equality to those who were rigid in their sex-role characteristics.

The results of the study showed that sex-role stereotypes were still prevelant. The experimental group, particularly the females, choose prestigious professions in comparison to the controlled group. Though both sexes in the experimental group exhibited high attainments professionally for they still choose professions according to their gender roles. Overall, both sexes were interested in the profession of law, which was considered to be neutral for either sex could attain this profession. "Males viewed law enforcement and piliots as future goals. Females choose airline hostesses, fashion designer, and modeling as future occupations," (Shamai, 1994, p.678).

Society proclams equality for all, but by the same token, it socializes and seperates the sexes which places them in different categories that leads to different occupations and professions. The implementation of the programs to eleminate sex-role biases in the schools did not prove to be entirely successful in removing these biases. Though the attainment for prestigious professions had positive results for the females, (pp. 665, 668, 669, 674).

Gender biases exist within our school systems. Teachers interact with the genders differently and this may be done on a conscious or unconscious level. The different socialization factors of the sexes influences teacher responses for males are given more attention in comparison to females. Males are called on more and are given more inspiration for their assertiveness. Males are praised more in regards to their originality in academic writings and females are praised for their works tidiness. Males are also encouraged and assisted in solving academic problems by their own means. In comparison, females

are usually given the correct answers. When teachers became aware of gender biases and were given training in these areas, females began to receive and equal education, (American Association of University Women, 1992, pp. 9 & 10).

The information presented an area that may reinforce males superiority though the use of text books, readers and tests. For the most part, the books predominately contain male figures. If text books do address females its far less then their male counterparts. In addition, tests may totally eliminate female figures. At the elementary school level, a significant amount of past and present famous males can be recalled but not females. This is excluding athletics and the entertainment industry.

The information also noted that males receive more attention in education institutions. Also, males insist for more of the teacher's attention then females do. This has been noted from as early as pre-school. Teachers may also be more intuned toward the praising of males and engaging in more dialogue with male responses. In addition, males tend to cause more disciplinary problems within the classroom which requires more teacher attention, (Rhodes, pp. 56 & 57).

The study addressed attention factors between students and teachers. Generally, males are noticed more, are more conspicuous within the classroom because of discipline problems. These problems receive more verbal attention from teachers. This is not an issure for females students. Adding, besides discipline issues, males interact verbally with teachers on a higher level then females do. Noting, that males receive more positive verbalization in reference to their academic accomplishments. Females receive negative verbalization for their academic achievements. They receive more approval in regards to appearance and appropriate mannerisms.

Stereotypical occupational attainments may be suggested as well, such as males are doctors and

females are nurses. The study also addressed the seperation of the sexes, whether its done by the teacher or by the students themselves for it may only include one gender. This may include lineup procedures, the boys against the girls activities or male and females social groups, (Weiner-Hirzler, 1980, pp.10, 11, 13).

Findings

A survey was decided upon in order to acquire various perspectives regarding the socialization of the genders. The survey consisted of eighteen subjects, sixteen females and two males. Then subjects were elementary school teachers from pre-kindergarten through the sixth grade. The teachers that partook in the survey were enrolled in an early childhood and elementary education graduate program. The survey was done in an questionnaire form.

The results of the survey showed the following:

-Thirty three-percent were neutral, twenty-seven percent agreed and twenty-two percent disagreed on whether males participate verbally more than females in academic matters. Written responses were: "I think it depends on the individuals personality." "Females dominate a class." "It has been my experience that boys seem to want more public attention than girls." "Males are more comfortable in academic matters." "The males students in my class give me more detailed answers." "It seems to be more prevalent as they get older." "They feel more confident, they have higher self-esteem." "It depends on the student."

-Fifty-seven percent were neutral and thirty-three percent disagreed on whether females are more assertive then males in academic matters. Written responses were: "The majority of females are more assertive." "Only certain ones when they know they are right." "The subject of the academics plays a

pivotal role in their participation." "Most young girls are still interested in dolls, their hair, than giving correct answers." "Women are more likely to shy away from the assertive men." "Females seem to have problems being assertive possibly because of self-esteem issues."

-Fifty-percent agreed and twenty-two percent disagreed on whether males demand more attention then females in academic matters. Written responses were: "This is my first year teaching experience and this has been the case." "It is my experience that males demand more attention than females because they are so much more unfocused on academics." "It depends on the class, but I have found this to be true." "My male students are eager to answer the questions and are interested in special events." "They seem to want to be noticed, while females rather not." "Females are usually more passive." "It depends on the student."

-Fifty-five percent disagreed and twenty-two agreed on whether females are more behaviorally inconsistent with classroom/school rules then males. Written responses follow: "I haven't experienced this in my classroom." "Again it depends, but I have a disproportional amount of male behavior problems." "I think its about even." "I think its because females are more moody than males." "Because they tend to give children more leeway within matters." "When males are a certain way behaviorally they stick to it. Females behaviors surprise me at times."

-Fifty-percent disagreed and twenty-seven percent were neutral on whether males and females have equal interests in all academic subjects. Written responses were: "Females think differently." "They are on different levels of the academic scale." "Men are more likely to gear towards math and history." "It depends on the individual." Also, "it depends on the individual." "It depends on the subject."

-Fifty-percent were neutral and forty-four percent disagreed on whether females are more interested in math and science then males. Written responses follow: "I haven't experienced this." "Some are, some aren't." "That has not been my experience, for the most part, I notice more males with sand and water and blocks than females." "Males are more likely geared toward math and history." "Males are taught to be inquisitive problem solvers. Females are taught to find a male to do that for them."

-Thirty-eight percent disagreed, thirty-three percent were neutral and twenty-seven percent agreed on whether males achieve higher grades in math and science then females. Written responses were: "It is not noticeable in kindergarten." "I think its about the same." "I haven't taught that long to experience and agree." "I think they are about equal." "Males are more interested." "Boys seem to understand what math and science is all about." "Males are taught to be inquisitive problem solvers. Females are taught to find a male to do that for them."

-Fifty-five percent were neutral and thirty-eight percent disagreed on whether females exhibit more confidence in their abilities toward math and science then males. Written responses were: "It's male dominated." "It depends on the individual." "Not usually, but if they are skilled, then yes." "It depends on the individual." "I think its about the same."

-Fifty-five percent disagreed and twenty-seven percent were neutral on whether males exhibit better verbal abilities in comparison to females. Written responses were: "I feel both are equally verbal." "Males feel intimidated by social influences to truly identify what they are thinking thereby never truly saying what they mean to say." "Females are taught to talk, males are taught to keep things inside." "Some do."

-Thirty-eight percent were neutral thirty-three percent disagreed and twenty-two percent agreed on

whether females are more assertive then males. Written responses were: "They can be equally assertive." "Some are." "It depends on the situation." "It depends, but usually males are more assertive." "At times, I think its because females have a bossy nature." "Yes, but it is not in the academic area."

-Thirty-eight percent agreed, twenty-two percent were neutral and twenty-two percent disagreed on whether females are more concerned with physical appearance then males. Written responses were: "I think that women can be more vain." "Some are, some aren't." "More females than males discuss appearance such as, don't I look pretty today?" "Beauty parlors, diets, make-up." "Because of our gender." "All societies communications lead to the message of women rather then men, watching their weight and looks." "These days both are." "Society." "Societal pressures."

-Thirty-eight percent agree, thirty-three percent were neutral and twenty-two percent disagreed on whether females are more confident in their abilities at doing "many things" out side of academics then males. Written responses were: "They can do more then one thing." "I haven't noticed any difference." "Girls like to clean the classroom." "Men get involved in sports." "I think it depends on what the subject is."

-Sixty-one percent agreed and twenty-two percent disagreed on whether males are more involved with mechanical or manipulating objects, toys, games, then females. Written responses were: "This may be true in my experiences." "Stereotypical." "I notice this in my classroom." The girls gravitate more towards housekeeping than toward mechanical." "In kindergarten, males seem more drawn to "mechanical" or manipulative-blocks, cars, etc." "God made them with that instinct." "Boys seem to build and destroy objects at the same time." "Depends whether women have been given the

opportunities to see other women perform the activities."

-Thirty-eight percent agreed, thirty-three percent were neutral and twenty-two disagreed on whether high achievements in math and science correlates to a high level in self confidence. Written responses were: "Giftedness in these areas." "High achievement in any subject correlates to high self confidence." "When you are confident in your work you have more self confidence." "Women are not viewed in such roles, thereby letting younger girls to believe that it is a male preference." "I believe it gives you more power."

-Fifty-five percent were neutral and thirty-three percent disagreed on the issue of whether females are better at solving math and science word problems then males. Written responses were: "Only if their interested." "I find that the girls take more time to understand what they read than the boys." "I haven't noticed a difference in kindergarten." "Men are more inclined toward math and science."

-Sixty-one percent disagreed and thirty-three percent were neutral on whether males are more interested in their writing abilities then females. Written responses were: "Females excel in writing." "It depends on the individual".

-Forty-four percent agreed, twenty-seven percent disagreed and twenty-two percent were neutral on the issue of whether females are more creative in their writings then males. Written responses were: "More imaginative." "I found that my boys will writer more imaginatively than my girls." "Depends on the individual." "I think writing is part of a feminine trait."

-Fifty-percent were neutral and thirty-eight percent disagreed and twenty-two percent agreed on whether females experience more difficulty in math and science then males. Written responses were: "I have heard this, but I'm not sure I agree." "Some do." "It depends." "I think the male has a nack for

math."

-Fifty-percent disagreed and forty-four were neutral on whether math and science are the least favorite subjects for males. Written responses were: "For some." "It depends ." "Most males teach math and science."

-Thirty-three percent were neutral, thirty-three percent disagreed and thirty-three percent agreed on whether females feel they are not "smart enough" in math and science in comparison to males. Written responses were: "Stereotypical." "It depends."

-Fifty-percent were neutral and twenty-two percent disagreed on whether males have higher grades in math and science then females. Written responses were: "I have not experienced this." "Some do." "I am not sure, I know they are more confident in these subjects."

-Thirty-eight percent were neutral, twenty-seven percent disagreed and twenty-two percent agreed on whether females find math and science as not being interesting subjects. Written responses were: "Not at all." "I think it depends on the presentation of the subject matter."

-Thirty-eight percent disagreed, thirty-three percent were neutral and eighteen-percent agreed on whether parents support males more in math and science then females. Written response were: "Gear male toward." "I haven't found this to be true." "I think a parent is interested in her child regardless of sex." "At one time I think they did, but today male and female need to achieve in all areas."

-Thirty-eight percent disagreed, thirty-three agreed and twenty-seven percent were neutral on whether males and females perceive their abilities in math and science on an equal basis. Written responses were: "Its hard to say, it depends on the person." "Females are lead to believe males are better." "I think so because on my level they are all given the same opportunity. They aren't coaxed

one way or another in my class." "Don't have any idea." "I believe they are all the same."

Discussion

The information presented addressed sex-role biases which occur in the elementary school system for females within this society. These biases were particularly focused in the subject areas of mathematics and the sciences. Recognizing that both genders succeed on an fairly equal basis in these subjects for the differences of females achievement begins to slowly decline approximately in the fourth grade.

The socialization of society consists of gender roles regarding which sex occupies and participates within its appropriate role. Addressing the subject areas of mathematics and the sciences are considered by society as roles for males. These stereotypical views effect females in acquiring a qualified education in these subject areas. Thus continuing the professions of mathematics and the sciences to remain male dominated.

The survey that was conducted among the eighteen early childhood and elementary school teachers provided interesting results. The results of the first two questions were not in agreement with the findings in the research,(Weiner-Hirzler, 1980), (Rhodes, 1997). The participants were neutral in regard to male verbalization and assertiveness in academic matters. Though the participants agreed with the research in which males demand more attention academically, (Rhodes, 1997) conflicts with the first two responses. In addition, the majority of written responses of the survey agreed with males being more verbal in academic matters. The participants agreed with the research findings in regard to the males misconduct within the school environment, (Weiner-Hirzler, 1980). They also responded neutral in reference to academic interests among the genders. Though the research noted that females

achieve in English, reading and writing, (Andre,Whigham, Hendrickson & Chambers, 1997). The majority of written responses of the survey noted that males were more interested in math and science. The participants also agreed with the research findings in reference to both genders equal achievements in math and science. This was in agreement to a certain extent, for females achievements in these subjects begin to slowly decline in the fourth grade,(Weiner-Hirzler, 1980). Though the participants chose both genders to be on an equal level in these subjects, for they responded neutral for either gender's confidence levels in relation to these subjects. The research noted that females begin to lose confidence in their abilities pertaining to these subjects at the fourth grade level. In addition, this becomes more prevalent at the middle school level, (Weiner-Hirzler, 1980), (Andre, Whigham, Hendrickson & Chambers, 1997). The participants also agreed with the research findings in reference to the importance of a female's physical appearance, (American Association of University Women, 1991). Also, the majority of written responses of the survey agreed with the importance of a females's physical appearance. They did not agree with the research findings for the males involvement with extra non academic activities, (American Association of University Women, 1991). Adding, they agreed with the research findings in reference to the males involvement with manipulating objects, (Frienze, Parsons, Johnson, Ruble & Zellman, 1979). In addition, the majority of written responses of the survey were also in agreement pertaining to males being more involved with manipulating objects. They were also in agreement with the research findings regarding the levels of achievement and confidence in mathematics and the sciences, (American Association of University Women, 1992). The survey also noted neutral responses in relation to either gender's achievements in solving math and science word problems. Though the research findings noted a decline in achievement for females at the fourth grade level,

(Weiner-Hirzler, 1980). It was also noted that males have better spatial abilities for solving many word problems in these subject areas, (Frienze, Parsons, Johnson, Ruble, & Zellman, 1979). In addition, this becomes more prevalent at the beginning of middle school, Weiner-Hirzler, 1980). The survey showed conflicting results for they agreed with the levels of achievement and confidence in these subjects for either gender, but they were neutral regarding the solving of word problems within these subjects.

The survey was also in agreement with the research findings in reference to a female's writing abilities. The research noted that females are more interested in reading which becomes more prevalent at the middle school level, (Andre, Whigham, Hendrickson, & Chambers, 1997). The survey was in agreement with female's in the subject of English but they responded neutral in reference to a female's interests in reading. This causes a conflict within the survey's responses. Adding, that the participants in the survey were neutral in reference to the difficulty female's experience in math and science. The research noted a decline in achievement for females at the fourth grade level, (Weiner-Hirzler, 1980). Though the survey was in agreement with the research findings in reference to the male's interest in math and science, (Banks & McGee-Banks, 1997). The survey was in agreement with the research findings that females achieve in their writing abilities, (Andre, Whigham, Hendrickson & Chambers, 1997). And that math and science are the least interesting subjects for males, (Banks & McGee-Banks, 1997).

In addition, the participants of the survey chose three different responses which were on the same percent level, (agree, neutral and disagree) in response to females not perceiving themselves as having the abilities for math and science. The research noted that females felt that they do not have the abilities

for these subjects, (American Association of University Women, 1992). The survey showed the differences in responses in relation to this issue. For those that agreed, a conflict resulted for the neutral responses selected in achievement and confidence levels, solving word problems in either subject and the difficulties female's experience in these subjects.

The survey's responses were neutral in relation to the higher achievements for males in math and science. The research noted that males progress to advance in mathematics and the sciences, (Banks, & McGee-Banks, 1997). The survey's responses were also neutral in relation to the female's interest in these subject areas. The research noted that there was a lack of interest in relation to the lack of achievements for females in these subjects, (American Association of University Women, 1992). In addition, the survey disagreed with the research findings in reference to parental support among genders in regard to these subjects. Noted in the research that it is more likely for males to be supported in math and science, (Andre, Whigham, Hendrickson, & Chambers, 1997). The survey's responses agreed with the research findings in relation to each gender's abilities in these subject areas. The research noted that females have the same abilities as males but they are lacking in self confidence within these subject areas, (Andre, Whigham, Hendrickson, & Chambers, 1997).

Conclusion

Published research shows that the socialization of society abides by sex-role segregation and biases, (Shamai, 1994). These sex-role biases also exist within the educational institutions, (American Association of University Women, 1992). In order to have an equal education for all children involved, the educators have to become aware of these biases. An unbiased education for females in the

subjects of mathematics and the sciences will determine an equal balance among the genders. Females will then be able to achieve in the same educational benefits and professions which at present remain male dominated. Otherwise, the large majority of females will remain in low paying jobs within traditional gender occupations.

The majority of participants that took part in the survey were females (sixteen) and two males. The majority were kindergarten teachers. Many of the questions relating to mathematics and the sciences would not be prevalent in these grade levels. The neutral responses given for many of the questions indicated a possible lack of awareness of existing sex-role biases in the schools.

References

American Association of University Women.(1991)., Shortchanging girls, shortchanging America.Washington, DC: American Association of University Women. (ERIC Document Reproduction Service No. ED 340 657)

American Association of University Women. (1992). Shortchanging girls, shortchanging American: A call to action. Washington, DC: American Association of University Women. (ERIC Document Reproduction Service No. ED 340 658)

Andre, T., Whigham, M.., Hendrickson, A., Chambers, S. (1997). Science and mathematics versus other school subjects areas: Pupil attitudes versus parent attitudes. Chicago, IL: Annual Meeting of the National Association for Research in Science Teaching. (ERIC Document Reproduction Service No. ED 416 092)

Banks, J. A., & McGee-Banks, C.A. (1997). Multi cultural education, issues, and perspectives. Needham Heights, MA: Allyn and Bacon.

Bartholomew, C.G. & Schnoor, D.L. (1991). Gender equity: Educational problems and possibilities female students. (Report No. UD 029 131; Reports 142). Chicago: American Public Works Association, Computer Services. (ERIC Document Reproduction Service No. ED 356 305)

Blakemore-Owen, J.E. & Russ, L.S. (1997). Preschool children's attitudes about deviations from gender-role behavior. Washington, DC: Biennial Meeting of the Society for Research in Child Development. (ERIC Document Reproduction Service No. ED 406 049)

Davison, P.J. (1997). Children's concepts of gender and professions. Washington, DC: Biennial Meeting of the Society for Research in Child Development. (ERIC Document Reproduction Service No. Ed 414 011)

Fear-Fenn, M. & Kapostasy, K.K. (1992). Math + science + technology = vocational preparation for girls: A difficult equation to balance. Columbus, Ohio: Ohio State University, Columbus. Center for Sex Equity. (ERIC Document Reproduction Service No. ED 341 863).

Frieze, T. H., Parsons, J.E., Johnson, P.B., Ruble, D.N., Zellman, G.L. (1978). Women and sex roles, a social psychological perspective. New York: W.W. Norton & Company, Inc.

Jewett, I..O. (1996). "And they is us": Gender issues in the instruction of science. (Report No SE 059 543; Information Analyses 070). Chicago: American Public Works Association, Computer Services. (ERIC Document Reproduction Service No. 402 202).

Levy, G.D., Taylor, M.G., Gilman, S.A. (1995). Traditional and evaluative aspects of flexibility in gender roles, social conventions, moral rules, and physical law. Child Development. 66. 515-531.

Rhode, D.L. (1997). Speaking of sex, the denial of gender inequality. Cambridge, Masschusettes: Harvard University Press.

Shamai, S. (Fall, 1994). Possibilities and limitations of a gender intervention program. Adolescence. 29. 666-680.

Weiner-Hirzler, E. (1980). Sex role stereotyping in the schools. National Educational Association of the United States.

Weis, C. (1988). Class, race and gender in American education. Albany: State University of New York Press.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

ERIC®

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title:

Sex-Role Biases at the Elementary School Level in Mathematics and the Sciences

Author(s): Joanne Goveknali

Corporate Source:

Publication Date:

4-18-99

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.

Check here
For Level 1 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) *and* paper copy.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all Level 2 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2

Check here
For Level 2 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but *not* in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at **Level 1**.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here→ please

Signature: Joanne Governali

Printed Name/Position/Title: Joanne Goveknali

Organization/Address: 115 E. Mosholu Parkway North, Bronx, N.Y. 10467

Telephone: 718-881-1962

FAX:

E-Mail Address:

Date:

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, *or*, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clea

Karen E. Smith. Acquisitions
ERIC/EECE
Children's Research Center
University of Illinois
51 Gerty Dr.
Champaign. IL 61820-7469

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to:

ERIC Processing and Reference Facility
1100 West Street, 2d Floor
Laurel, Maryland 20707-3598

Telephone: 301-497-4080
Toll Free: 800-799-3742
FAX: 301-953-0263
e-mail: ericfac@inet.ed.gov
WWW: http://ericfac.piccard.csc.com

(Rev. 6/96)