



5-2010

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Gender Differences in Attitudes toward Math and Science among Elementary
Students: An Exploration of the Role of Teachers

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Introduction

Education is a vitally important institution in our society. It can act as an equalizer for people from many different geographic areas, races, genders, classes, etc. Ideally a person from a very wealthy family and a person from a very poor family will receive an equal education, affording each the opportunity to go on to whichever careers they desire.

Math and science are two subject areas that are proven to be imperative for our society in terms of progress and success. These two subjects are important in order for the United States to continue to be a leader in this continually changing technological world. It is important for students to have a deep understanding of the concepts of both of these subjects from the beginning of their education. As society continues to become more reliant on technology, jobs are going to require a higher level of understanding of these concepts. It is important that everyone receives an equal educational experience in these subjects because of all of these realities.

Gender remains a dividing status between members of society today. In institutions such as education, this is especially evident. The research supports that there are gender differences in attitudes to and performances in math and science. This paper will investigate how and at what age these differences develop, as well as what socialization agents contribute to these gender differences. This research will explore these issues through interviews and observation in first and fourth grade classrooms.

Literature Review

The education system, as some sociologists have said, is the beginning of a process to differentiate between the potentially successful and unsuccessful members of

society. Also, “since schools are created by governments, whose top decision-making officials are elected, they are political creations,” (Handel, Cahill, & Elkin, 2007).

Another researcher stated it very well by saying, “Public schools play an important part in the allocation of prestige, money, status, and power,” (Hansot & Tyack, 1988). In order for the institution of education to most efficiently divide up commodities like prestige, money, status and power, there must be discriminatory practices present to divide people by. This is where discrimination based on race, gender, sexual orientation, and socio-economic status come in.

Parents contribute to the socialization of gender roles in their children. From the moment a child is born, they are given a name that carries with it a gender role which the child is expected to fulfill. The child’s nursery, clothes, book, toys, television shows, etc. all transmit ideas about what role the child must fill.

Schools as a whole also contribute to gender role socialization and discrimination. Textbooks and children’s literature are places that exhibit gender roles that students pick up on. In the 1991 study discussed by Sadker, Sadker, and Klein, women and girls were underrepresented in basal readers that were in widespread use in the 1970’s. When they were included, they were in stereotypical roles. The Women on Words and Images group found that there was a 5:2 ratio of boy-centered stories to girl-centered stories. Also, there were 147 different occupations depicted for males and only 25 for females. One demeaning portrayal of women that was found in a reader said, “Women’s advice is never worth two pennies. Yours isn’t worth even a penny,” (Sadker, Sadker, & Klein, 1991). Another said, “Look at her, Mother, just look at her. She is just like a girl. She gives up,” (Sadker, Sadker, & Klein, 1991). Another still said, “We are willing to share

our great thoughts with mankind. However, you happen to be a girl,” (Sadker, Sadker, & Klein, 1991). *Feminists on Children’s Literature* examined 49 Newberry Medal winners, which are supposed to be some of the best books published, and they found that “books about boys outnumber books about girls by 3 to 1. They also found that the books contained sex stereotypes as well as derogatory comments about females,” (Sadker, Sadker, & Klein, 1991).

When a child enters school, the teacher and peers then further push the child to conform to their socially constructed gender roles. Teachers’ attitudes about their students can directly affect the way they teach certain students. These attitudes seem to be influenced by the degree to which children conform to teachers’ perceptions of acceptable student attributes. This can be affected by whether or not the teacher perceives the child as acting in their appropriate sex roles.

A study by Peggy Orenstein in 1994 entitled, *Schoolgirls: Young Women, Self Esteem, and the Confidence Gap*, is an excellent example of many of the gender issues that pervade our classrooms today. She discusses many issues like sexual harassment and feelings of inferiority among girls. Orenstein, like so many others, discusses the idea of the “hidden curriculum.” She talks about a classroom experience in which the boys were able to answer the questions and receive the praise just because they blurted out. She said that while another student, a female, might know the answer, she probably will not speak up because she is socialized to act docile. If girls do shout out answers in the class, they are normally the easiest, lowest-risk questions. The teacher “does nothing to condone the boys’ aggressiveness, but she doesn’t have to: they insist on- and receive- her attention even when she consciously tries to shift it elsewhere in order to make the

class more equitable,” (Orenstein, 1994). When one girl speaks up in the class and gets the answer wrong, she concludes, “Oh yeah, that’s about the only time I ever talked in there. I’ll never do that again,” (Orenstein, 1994). It is shown that “students who talk in class have more opportunity to enhance self-esteem through exposure to praise; they have the luxury of learning from mistakes and they develop the perspective to see failure as an educational tool,” (Orenstein, 1994).

According to perceived sex roles, a teacher can either motivate or hinder a students’ learning. This is often a subconscious task, but it does derive from the society, since teachers are part of society, too. In our society, males are seen as the more powerful and intelligent group, and therefore teachers transmit this idea in their classrooms. This is especially evident in the subjects of math and science in elementary school, because those are the subjects which involve tasks perceived by society as more difficult. Excellence in these subjects also leads the student on to jobs in the more lucrative careers in our society, so it makes sense that males are better taught in these subjects. This goes along with the idea of gender essentialism, which is “the idea that there are unique male and female traits that make men and women naturally suited to different occupational roles,” (Marger, 2008).

One study found that 66 percent of all sexist incidents occurred in chemistry classes. This included “blatant discussion domination by boys, teachers favoring boys, and the humiliation of girls,” (Lee, 1994). There was also a considerable amount more boys than girls in chemistry classes. In math classes, a study found that both boys and girls “showed the most enthusiasm for mathematics in the elementary years,” (Wimer, Ridenour, & Place, 2001), but by early adolescence, the percentages of boys enthusiastic

about math dropped from 84 percent to 72 percent, and for girls from 81 percent to 61 percent. Then by high school, only 25 percent of boys and 15 percent of girls considered themselves good at math. Girls reasoned that they were “just not smart enough” which is an idea that is engrained in our society.

The book by Peggy Orenstein also tackled the issue of the fact that girls are not encouraged in math and science. Girls are not likely to retain affection for math and science like boys. Their confidence continues to diminish as they get older, and so does their understanding of the subjects. Finally, that leaves boys outperforming girls in either subject, which is proven to have an effect on their earning potential later in life (Orenstein, 1994).

Another study found that teachers ask boys more questions than they ask girls, and the questions typically involve academic content, even if the teachers don't know they are doing it. The authors posit that the reason mathematics is more challenging to girls is because of cultural and media messages that promote female appearance more than mathematics ability. Also, “the disparity in mathematics performance between boys and girls shows increases as children grow older and social influences are manifested,” (Wimer, Ridenour, & Place, 2001).

Researchers state that it is proven that teachers interact with male students much more frequently. In science and math classrooms, this interaction level is even higher. It has also been proven that praise from a teacher is crucial to a students' success in school. So, if teachers are favoring boys, it is obvious that they have a much better opportunity to perform above others. Girls are expected to be more docile in the classroom, almost to the point they are invisible. “They receive fewer academic contacts, less praise, fewer

complex and abstract questions, and less instruction on how to do things for themselves,” (Stitt, 1988).

My research will study the following questions: Are gender differences in students’ attitudes toward math and science apparent in first grade? Are gender differences in students’ attitudes toward math and science in place by fourth grade? What role do teachers play in instigating or reinforcing gender differences in these attitudes?

Research Design

This study was conducted as a qualitative study measuring the difference between boys’ and girls’ attitudes to math and science. This researcher conducted individual interviews with students using questions developed from the literature review. Five girls and five boys in first grade (ages six to seven years old), as well as five girls and five boys in fourth grade (ages nine to eleven years old) were interviewed.

A focus group was also conducted to see if students’ answers change when they are placed in mixed gender groups. The focus group was conducted with two of the girls and two of the boys from first grade and included students that had previously participated in the individual interviews. The researcher also observed several first grade classrooms, as well as fourth and fifth grade classrooms to study instances of gender socialization that occurred in the classroom.

Data collection took place at a Title 1 school in the Knoxville metro area. 70 percent of the students are Caucasian, 21 percent are African-American, and 7 percent are Hispanic. 51 percent of the students receive free lunch, while eight percent receive reduced-price lunch. Students were chosen at random from the parental consent forms that were returned to school. An equal number of each gender were chosen.

Analysis

Students were asked various questions about their school subject preferences, especially their interest in math and science. Many interesting conclusions were found. When asked if the students liked school, all first graders that were questioned responded favorably. When asked the same question, all fourth grade females responded favorably; however, only two males stated that they liked school. The others gave answers such as, “some parts,” or “no, and I’m not sure why.” This is contrary to this researcher’s predictions. The research suggests that males are more frequently and positively praised. It seems that students who are praised in such a way would think more favorably of school.

Students were asked what their favorite subject was in order to discover if math and/or science were highly favored. In first grade, all of the females responded as liking math or science the most, while only 3 males responded in that way. The males that liked subjects other than math or science responded that they liked gym the best, which is a very stereotypical response for males. It was surprising to find that all the females like math or science, especially when, according to research, those students are not pushed to excel in those classes. In fourth grade, responses were equal among the genders with a majority of both males and females responding that they liked math or science best. In the fourth grade; however, respondents said that they liked reading, which was not an answer among fourth graders. This may show that there is less of an intense focus on reading in the fourth grade, allowing students to read for enjoyment rather than fluency.

Next, students were asked about feelings toward math in particular. Results showed that more females than males liked the subject in both grades. This is also a very

surprising finding, due to the fact that society believes that males are supposed to not only enjoy, but be more advanced at, math. Students were asked who they thought the best math student in their class was. Several of the males in both grades stated that they themselves were the best math students in their class. No females were this sure of their own mathematic abilities. This is certainly consistent with findings. Even if the females really did think they were the best math student, research supports that they probably would not say so due to lack of self-esteem or fear of rejection. Girls, according to society, are supposed to appear docile and allow boys to be superior. Additionally, it was found that, overall, most students really believed that a male was the better math student. This was consistent among both first and fourth grades. What did differ was the fact that more males thought this in first grade, while more females thought this in fourth grade.

Finally, students were asked about their feelings toward science. In first grade, all students reported that they liked the subject. In fourth grade, however, two females and one male said that they did not like the subject. They found it “boring” or “hard.” The male that responded unfavorably about science, though, mentioned that he only disliked it because his class is working on a project right now that he does not like. Therefore, generally, he likes the subject. So, only females disliked science, which is consistent with research. When asked about who they thought was the best science student in their class, many students in both grades were unsure or said, “everybody.” This leads the researcher to believe that the class is not as focused on achievement. One of the fourth grade students mentioned that they “watch lots of movies” in that class, so that is probably the case. However, it is interesting to note that more females than males in

fourth grade mentioned a male as being the best science student. Again, this supports the idea that males are considered by society to be more skilled at math and science.

Students were asked what they liked to do during recess as a way of familiarizing them with the researcher and the questioning format. Some interesting conclusions were found during this portion of the interview. Overwhelmingly, the answers were very stereotypical. Almost all of the females in both grades reported that they enjoyed swinging on the swings. A few of the older females mentioned that they enjoyed playing basketball or soccer. The males in first grade mentioned that they enjoyed playing “Star Wars” or “Halo,” (which was explained as being a game where you “kill aliens”). These are not surprising answers, because they are violent activities, consistent with what many boys think they are supposed to enjoy. One male actually said that he liked to read during recess, which was surprising. The fourth grade did not differ among genders as much. Most of the fourth grade students said that they enjoyed playing sports. There was one female student who reported enjoying to “play on the bars and do flips,” which is a stereotypical response for a female.

All students were asked about the kind of grades they get in math and science, and all students responded that they receive “pretty good,” “good” or “great” grades. This was not considered to be very conclusive or important for the study, since most students felt they performed well in the classes.

When the students were asked why they liked math, answers were very interesting. In first grade, several of the reasons for liking math were just based on whether it was enjoyable to them or not, for example, “because you use gummy bears and then get to eat them,” or “because you get to play with stick cubes to measure with.”

Other answers were more about certain aspects of the subject that they enjoyed, including, “subtraction,” “multiplication,” and “adding.” One student responded that they liked math simply because, “you get to do numbers.” In fourth grade, the answers became a bit more sophisticated, with students responding that they enjoy math either because they’re “really good at it” or they “have a good math teacher.” They also liked the subject because “some of the things are challenging.”

Students’ answers for liking science were just as intriguing. Many first graders could not completely put their enjoyment of the subject into words, because several of the answers were, “because you learn stuff,” “because you do stuff,” “because it tells you things,” and because the student “likes to figure stuff out.” The other students in first grade liked science because they were good at it. The fourth grade students, again, gave more information to support their enjoyment of science. They enjoyed “figuring out cool things like animals,” “learning about animals, habitats and cells,” and “doing experiments and projects.” Students also enjoyed the hands-on aspect of science.

The final questions that the students were asked dealt with homework in each of the subjects. Students were asked how much time they spent at home on math, and many of the first graders did not spend any time at home on it. It is likely that the teacher does not require them to do activities at home. For those in first grade who did report working on math at home, the interesting information was found in who helped them with the subject. Four students reported that a male in the family (father or brother) helped them study. Only three students said that their mother helped. In fourth grade, four students reported a male helped them while only two said a female did. One of the students mentioned that their dad helped them with math, while their mother helped with reading.

That supports the research that states that society believes men are better in certain subjects naturally, and women in others. Women are supposed to be more proficient in reading or language arts classes. This is reflected in the way this student's parents raise their family.

The amount of time spent on science at home also yielded some fascinating results. Again, many of the first graders reported not having any homework or not spending much, if any, time at home on science. For those that did, they overwhelmingly said that their mothers helped them with science. There were three students that reported this to be the case, as opposed to one student whose father helps her with science work. This was actually a surprising finding, because it was expected that answers would be similar to the answers about math and show that males were more likely to help out with science, since they are both subjects that are considered male-dominated. Among fourth grade students, there were more responses that showed that the students did study science at home, including a student that liked to study his textbook disk for practice. One of the students mentioned that his mother does experiments with him at home. The responses from the fourth graders about who helps them with science at home were all fairly the same, with most students saying that both parents and sometimes grandparents and siblings helped them.

The focus group did not work out as planned. The male students talked to each other, while the female students did the same. There was no mingling of ideas: they were simply telling each other answers they had already given me in the individual interviews, and then telling me again. They were not interested in what the other gender group had to say. This could have been due to their age and limited understanding of this type of

group communication, or it could have had to do with the researcher's inexperience in conducting a focus group. In either case, it was not a successful experience.

Conclusions

The findings from this study were mixed. Some answers were highly stereotypical and definitely represented the norm in our society, as well as supported the research that math and science are considered to be the males' domain. Other answers were very contradictory to that and showed that maybe advances are being made and society is beginning to see that the gender divide in school is unnecessary and unjust. The research in the field shows that not only do boys enjoy math and science more than girls, but they are likely to retain this affection much longer than girls. This seems to be true of science, according to this study, but does not seem to be the case for math, because more girls reported liking math in fourth grade than boys. Some of the fourth grade girls mentioned that science was boring, so possibly their disdain from the subject comes from the lack of challenge presented in that course, which would not suggest that they are being less motivated or praised by their teacher in that case. However, the students who said that the class was hard may not be getting the support from the teacher that they need to succeed. This could be due to the fact that it is common in our society to think that girls do not have the ability to understand science's complexities.

It is vital that students are treated equally in the classroom. They should be equally called on, praised, supported, motivated, and punished. These are important so that every student may have a deeper understanding of all disciplines, especially math and science. In our changing world, an understanding of technology has become crucial

to remain competitive, and along with that comes an advanced knowledge of math and science.

This study contributes to the field of research because it gives a fresh look at the thoughts of students. It shows that maybe we as a society are making some advances in this area of gender equality in schools. However, it also shows that there are many gender stereotypes that still must be broken down. Teachers and parents must be the ones to do this through modeling appropriate behavior and communication, talking openly about gender issues, and most of all, being acutely aware how their actions might affect the self-esteem of a child, and in turn, that child's future.

In the future, longitudinal studies on this topic should be done to analyze whether the same group of students truly do change their attitudes from first to fourth grade. It would also be beneficial to do a more ethnographic study where the students get to know the researcher with the hopes that they would be more willing to share their feelings and would give more substantial answers. This would aid in making the focus groups more beneficial as well. It also would be helpful to give a survey to teachers about their perceptions of the gender differences in attitudes among males and females and also their perceptions of their own role in that divide. When teachers become aware of their role in this issue, it will be easier to initiate greater change.

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