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Gender differences

The topic of my research has been differences in math learning and aptitude between boys and girls. This topic was suggested to me by my mentor, Mike Millo, as it is of particular interest to him. Mr. Millo is an Algebra teacher at Ball High. Much has been made of gender differences in math by the popular media and Mr. Millo felt that it would be interesting to examine this topic and explore the findings of educational researchers. I also found this topic personally intriguing as I am currently reading the book, *Failing At Fairness: How Our Schools Cheat Girls*, by Myra and David Sadker (1994), which explores gender bias in all area of education. In researching this topic I found many related research articles and extensive articles where relevant variables had been measured. I tried

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D 1/6

to focus on highly relevant articles, which examined specifically the different abilities of males and females in math or sought explanations for those differences. With one exception, the studies I reviewed supported that there are differences in math related achievement between males and females. Two of the articles I reviewed focus on the differences in teacher interaction with male and female students in math class rooms. The Structure of Abilities in Math-Precocious Young Children: Gender Similarities and Differences by: Nancy Orbinson, Robert D. Abbott, Virginia W. Berninger, and Julie Busse (1996), the following research questions were explored: 1. Can young children who are advanced in mathematical reasoning be located efficiently by soliciting parent nominations? 2. Do measures of these children's cognitive abilities in other domains also show advancement and, if so, to what degree? 3. How do measures in verbal and visual-spatial domains relate to mathematical skills for subgroups divided by grade and gender? 4. What, if any, cognitive gender differences emerge within this group of young precocious children? My interest was focused on the last question, which relates to gender differences. The study showed gender differences apparent in every analysis. However, the study does not propose reasons for these differences. One of the possible implications of this study, that gender related differences in math ability are apparent from such a young age conflicts with information presented some of the other papers I reviewed. In three studies, there is a great emphasis on gender related abilities in math which are related to adolescence. In Gender Roles in Marriage: What do They Mean for Girls' and Boys' School Achievement, by Kimberly A. Updegraff, Susan M. McHale and Ann C. Crouter (1996), the researchers evaluate differences in family dynamics to determine what implications these might have for gender related math ability. This article was very interesting, although the research question was biting off more than it could chew. What this article finds is that girls from families who have a more egalitarian family structure are less likely to suffer a decline in math ability at adolescence. This article also suggests that it is not the girls "hard wiring" which causes math ability differences. I interpret this article as implying that the root of the problem could be in gender role stereo types. In Single Sex Math Classes: What and For Whom? One School's Experiences, Richard Durost (1996) reports that when administrators

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talked to many of the girls in his school, the girls stated that they felt mentally intimidated by the boys. Teachers noted that boys asked questions, talked and competed, while girls tended to reflect, listen, and cooperate. In an attempt to deal with gender related performance issues, Mr. Durost's school implemented a all female section Algebra I. The females who participated in the pilot program did show an increase in their math scores. This paper suggests that the differences in math ability are not "hard wired". That it may not be a difference in a girl's ability to "do" math or learn math, but perhaps a difficulty in a girls ability to interact in a co-educational math related settings which determines her math success. In other words, there might not be a math problem in and of itself but perhaps math differences were one manifestation of differences in inter-gender communication and interaction styles. In Gender Based Education: Why it Works at the Middle School Level, William C. Perry (1996), the principal of a middle school cites studies from the American Association of University Women (1991, 1992), supporting the theory that gender related math ability differences don't become manifest until middle school. Mr. Perry was very concerned about reports he had read or heard presented showing that there is bias against girls in the classrooms. In response to the researchers concerns, a study was done in which participating students were assigned to same sex classes. The study reports increased grade point averages for both boys and girls participating in the study. I would have liked to see the standardized test scores for both groups of students. While grades are one indicator of performance, it seems that if there is bias in teaching styles, there could be bias in grading. Standardized scores could give a better vantage point for analyzing actual differences in math comprehension. This study ties in with the following two studies which point to an institutionalized problem In G. Leder's research, Teacher Student Interactions in the Mathematics Classroom: A Different Perspective, the researcher video tapes classes to determine types and frequency of interactions with students. this was correlated with test scores, perception reports from teachers as well as self reports of math perceived math ability of the students. In this study, males and females were relatively equal in ability n the lower grade levels, but males tended to do better in the 10th grade level. This becomes very intriguing when it is noted that self report and teacher reports of perceived

D 3/6

ability consistently rated the males higher. The qualitative aspects of this study examined content and frequency of teacher comments. There was no significant difference between males and females. In J. Becker's research, *Differential Treatment of Females and Males in Mathematics Classes*, the researcher observed 10 classrooms for a total of 10 days. She collected both qualitative and quantitative data. The author concludes that there is very clearly differences in the interactions between teachers and students depending on the students gender. These differences consistently favor the males. This study also reveals that both the classrooms and teachers themselves reinforce gender stereotypes portraying math as a male realm. this researcher asserts that the failure of females to excel in math is attributable to self fulfilling prophecy: girls are not expected by themselves or their teachers to do well, therefore, ultimately, they do not. My last two articles examine gender differences at the university level. The first of these two does not examine math ability, but rather attention to numerical information in gender related contexts. *The Numbers Game: Gender and Attention to Numerical Information*, by Jackson, Fleury, Girvin and Gerard (1995), compared men's and women's abilities to recall numerical information when it was presented in a gender related context. Not surprisingly, men were better at recalling data in male settings than women were. However, of the three context categories (male, female, neutral) both men and women did best in the neutral categories and worst in the female categories. The author suggests that this could reflect the tendency of the culture to view female related activities as less important than male or gender-neutral activities. The final article I reviewed was *Gender and Mathematics Achievement Parity: Evidence from Post-Secondary Education*, by Amin M. Kianian (1995). This study seemed flawed in several ways. The study examines the grades of all of the students from one teacher's university level math classes over a period of three years and then compares them for gender differences. His findings are that there are no significant differences between men's and women's math grades at the university level. I believe this study could be better than it is, because it does not show whether or not the men and women actually had a demonstratedly equal math ability. Grades could be very subjective. Accepted at face value, however, it could be suggested that this might imply that the gender related issues so prominent in the

D 4/6

eyes of some researchers when examining the adolescent population, have disappeared by the time students go to college. I realize that this would be stretching the relevance of the study to go this far, but there are implications along these lines. Overall, after reviewing the articles which were summarized, I find myself drawn to the information showing that the gender differences in math ability seem to be predominantly manifest during adolescence. As many of the studies suggest, this is likely to be associated with interpersonal and self esteem issues. Many issues come to mind for further research. 1.) Self esteem in adolescent girls and the correlation with math ability. 2.) Does participation in sports affect gender related math learning? 3.) What are the implications of single sex classrooms for later learning? Are single sex class rooms creating a false environment, thus setting females up for "gender shock" later in life or education? 4.) What are the implications of female math teachers in the classrooms for gender related differences in math abilities. 5.) A cohort study of x population tracking them over and extended period of time to see at what points math ability, self esteem, and other related variables fluctuate. Some of these topics would be very suitable for immediate research. Others, would be best left to highly funded groups or government agencies. For my further research, I would like to explore the relationship between assertiveness in adolescent girls and its relationship to their math success. More specifically, I would like to devise a study that examines whether or not assertiveness training in adolescent girls would impact their math success. References American Association of University Women. (1991). Shortchanging Girls, Shortchanging America. American Association of University Women: Washington, DC American Association of University Women. (1992). How Schools Shortchange Girls. American Association of University Women: Washington, DC Becker, J. (1981). differential treatment of females and males in mathematics classes. Journal for Research in Mathematics Education. 12, 40-53. Durost, R. (1996). Single sex math classes: What and for whom? One school's experiences. Bulletin, 80, 27-31. Jackson, L., Fleury, R., Girvin, J., & Gerard. D. (1995). The numbers game: Gender and attention to numerical information. Sex Roles: A Journal of Research. 33, 559-569. Kianian, A. (1995). Gender and mathematics achievement parity: Evidence from post-secondary education. Education, 116,

D 5/6

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