Bridging the gender gap in mathematics essay sample

Science, Mathematics

Research around the world supports an assumption of better male performance in mathematics. A cross-country project entitled The Third International Mathematics and Science Study found that gender gaps in mathematics achievement were small until high school. Then, in every country under survey save one, males outperformed females (Kadriye, Lapointe, & McCreith, 2005). Such results are consistent in several related studies. What accounts for these differences? While some claim biological roots explain this phenomenon, a closer examination of the literature reveals a more likely source: cultural expectation. A long-held theory regarding math differences holds that males possess a natural ability to understand more complex mathematical concepts. Support for this assumption primarily derives from research into spatial reasoning. The spatial method of problem solving involves mental rotation, and such techniques are prominent in higher level mathematics courses one might find in high school and college (such as calculus and geometry). Since numerous studies have demonstrated that males score higher on tests of spatial reasoning, some theorists reason that males will therefore excel in subjects which emphasize this characteristic.

However, a considerable amount of research exists which challenges such a viewpoint. Several researchers have found no discernible correlation between spatial reasoning ability and mathematical ability. Even in studies which did reveal differences in spatial reasoning capabilities, factors such as timed tests vs. un-timed tests (Sex differences and science careers, 2005) or question format (Manon & Zhang, 2001) were found to exert influence on results. Another important consideration is the source of these alleged

differences. Some might argue that males score higher on spatial reasoning tasks and mathematics in general due to biological factors. Yet if this is the case, then why has the gap between the genders been reduced by half in the pasty sixty years (Gender differences in mathematics, 2006)? Biology can rarely be changed, but socio-cultural factors can. If environmental and cultural factors are the source of a problem, the chances of remedying that problem increase substantially.

The fact that gender differences in mathematical performance vary widely depending on economic background, ethnic background, and other environmental factors (Penner, 1980) points to a very possible socio-cultural influence. What are these factors? For one, girls in many societies are conditioned to follow the rules, be polite, and not to question authority. When these girls enter an educational setting, they do just so. They speak less, agree more, and faithfully follow the rules a teacher sets forth. Research has validated that males tend to be more outspoken in class (Gender, interaction, 2006), and the extensive Cognitively Guided Instruction longitudinal study found that females used concrete problem-solving strategies (algorithms, modeling, and so forth)to approach a mathematical puzzle. Why? A lengthy panel discussion of the issue concluded that girls simply followed the rules, using the strategies expected of them in class. Meanwhile, males (feeling less of a conforming pressure) tended to invent strategies of their own, providing them a better overall grasp of the concepts (Fennema, 2000). Taking this passivity theory a step further, girls may also feel reluctant to seek assistance from instructors due to a perceived

favoritism toward the males. Studies such as the 1982 Gilligan and Spender projects have uncovered a noticeable divide of the amount of attention given to males and females in coeducational settings (Smith, 2006).

In short, environment encourages independent thinking in males, while (consciously or not) discouraging it in females. But, one might ask, why is the gap so prominent in the area of mathematics? The answer may lie in two words: stereotype threat. In other words, both males and females are taught by society long before they are ever taught in a classroom. Girls are better at reading, writing, art, music—verbal and creative expression. Likewise, logic, numbers, and science are the domain of boys. These self-perceptions have been confirmed in aptitude evaluations (Skaalvik & Skaalvik, 2004). As such, a boy faced with a verbal task and a girl faced with a quantitative task will experience the same anxiety and the same self-doubt, hampering performance. One study, for example, divided its subjects into a control group: those who were told their math test would be used in gender comparisons and those who received no such information. As expected, the experimental group (the girls who were given the pre-test information) scored lower (Barquissau & Schmader, 2004).

Surveys have also revealed that girls may feel more conscious about speaking up in class with a large number of males present, and that such preoccupations dissipate in single-gender schools (Smith, 2006). In fact, results of a 2002 study showed a twelve percent increase in math test performance for females when no males were present in the room (Gender differences in mathematics, 2006). Family and society often do little to

counter these negative self-evaluations. Socialization research finds that parents often attribute their daughters' poor math performance to gender stereotypes, and put no pressure on the girls to improve performance (Barquissau & Schmader, 2004).

On a higher societal level, mathematics is often linked with " masculine" professions (such as engineering). (Avalon, 2003) Women who want to study these fields may fear shunning from both male colleagues and female peers. Such considerations will factor into a person's consciousness more in the peer-pressure heavy, social super-consciousness typical of pre-adolescence and adolescence.... aka the junior high and high school years. The number of women enrolled in higher level mathematics courses and employed in math-heavy professions has increased (Barquissau & Schmader, 2004). Why? Perhaps the new wave of intervention programs (such as the Multiplying Options and Subtracting Bias) (Fennema, 2000) designed to decrease stereotypical views and innovate student-teacher interaction has finally made its mark. What characteristic do most of these programs share?...an emphasis on the cognitive-behavioral and socio-cultural aspects of reform.

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