

Research on the Male/Female Student Achievement Gap

While for the past several decades, educators worried about girls' performance in science and math, recently boys' lagging literacy skills and academic performance became more pressing concerns. The most recent issue of *Education Week* describes this shift in an article titled, "Concern over gender gaps shifting to boys."

It is important to point out that achievement differences within genders and those due to racial/ethnic background and socioeconomic status are much greater than differences between genders. Hyde (2005) examined the effect sizes of 46 meta-analyses of gender differences in cognitive abilities, verbal or nonverbal communication, social or personality characteristics, psychological well-being, motor behaviors, and other constructs, such as moral reasoning. Seventy-eight percent of the effect sizes were in the close-to-zero range or small range. Results for cognitive abilities were mixed, with strong evidence for differences only in the area of spatial abilities. With respect to language and literacy, Feingold (1988) found moderate differences favoring girls in spelling and language, while Hyde and Linn (1988) and Hedges and Nowell (1995) reported effect sizes close to zero in studies on reading comprehension and vocabulary. In effect size studies of mathematical abilities, Hyde, et al. (1990), Hedges and Nowell (1995) and Feingold (1988) found no or small effect sizes for gender differences in overall mathematics achievement, numerical ability, mathematics computation, concepts, and problem solving. In contrast, Linn & Peterson (1985) and Voyer et al. (1995) found moderate to large differences in spatial abilities that favored males.

This summary shows the general results of the research on gender differences in achievement. Studies are presented first for schools overall, and then in the specific content areas of literacy, mathematics, and science. Factors hypothesized to be associated with differences in academic performance are then presented.

Research Results on Overall School Performance

- Females outperformed males in reading and writing at all grade levels on the NAEP (Coley, 2001).
- While white fourth-grade males scored higher than females on the 1992 and 1996 NAEP mathematics tests, across all ethnic groups, gender differences were non-existent in grades 8 & 12 (Coley, 2001).
- Female college-bound students were more likely than males to complete college preparatory courses than males. While females used to lag behind males in number of mathematics and science courses taken, in 2000, they participated in the same or nearly the same number (Coley, 2001).
- Female white and Hispanic students were more likely to complete high school than males and this gap is increasing (Coley, 2001).

- Across all racial/ethnic groups except Asian/American students, females were more apt to attend and complete college than males (Coley, 2001).
- Males were more apt to be diagnosed with a reading disability than females (Rutter et al., 2004).

Research Results in Literacy

- Boys were more likely to be diagnosed as reading disabled than girls; however, the size of the gender gap varied across countries (Rutter et al., 2004).
- Girls entered school with better literacy skills, and the gap increased slightly during the kindergarten year (Ready, et al., 2005).
- Some studies indicated that girls performed better at word recognition and comprehension tasks; however, others did not. Teacher characteristics were found to contribute to the size of the gap in comprehension. Students of female teachers and those with more years of pre-service training showed smaller gender differences (Wilkinson, 1998).
- Differences in approaches to learning among young children contributed to the gender gap. Young boys were rated by teachers as using fewer effective approaches to learning (e.g., attentiveness) and these lower ratings were associated with lower gains in literacy skills during kindergarten (Ready et al., 2005).
- In early childhood, boys and girls had similar attitudes toward reading. However, that gap in literacy attitudes and practices increased throughout elementary school. This trend may reflect the fact that boys' reading interests were not being addressed in school. Boys reported disliking the kinds of things they had to read for school and preferring magazines and adventure and scary stories. One study showed that high interest reading materials, but not the presence of a male teacher, were associated with improved reading performance in boys (Sokal, et al., 2005).

Research Results in Science

- Gender differences in science achievement on the NAEP and science course taking between boys and girls were minimal (Coley, 2001).
- Some interventions to improve girls' attitudes toward and performance in science were effective while others were not. For example, teachers' use of an inquiry approach that combined efforts to raise student interest and engagement, including appropriate laboratory techniques, problem solving, scientific writing, and further study reduced the gap between boys and girls. A physics intervention using an adapted physics curriculum led to increased achievement among boys

and girls, but only under a condition involving part-time, single sex instruction. A chemistry approach that included visual representation of matter led to better performance by girls.

Research Results in Mathematics

- A study of gender gaps in mathematics achievement and attitude as measured by the NAEP from 1990 to 2003 showed that gaps in mathematics were generally small, but consistent across NAEP administrations. Gender differences were greatest in the areas of measurement, number and operations, and geometry. Gender differences tend to be concentrated in the upper-end of score distributions and most consistent for white, high SES students, although there were also gender differences for Hispanic students (McGraw, Lubienski, & Strutchens, 2006).
- Except for Hispanic students, the number of mathematics courses taken by girls was similar to the number taken by boys (Coley, 2001).
- One study showed that math achievement predicted later achievement in and attitudes toward math for both boys and girls (Ma & Xu, 2004).

A Word of Caution

While boys' success in several academic domains lagged behind that of girls, it is important to point out that there were contradictory findings. For example, on the SAT/Verbal Test, no differences occurred in the performance of males and females in any ethnic group, except among African Americans (Coley, 2001). On the SAT/Mathematics Test, males in all racial/ethnic groups scored higher than females (Coley, 2001).

Research on Sources of Male/Female Differences in Academic Performances

Biology

Research on the biological explanation of gaps in performance suggested that differences in brain structure, hormone production, and/or maturation rates may account for girls' greater advantage in school-related tasks. Research showed that the parts of the brain responsible for processing verbal information and permitting the exchange of information between hemispheres were more highly developed in girls (Kimura, 2005). Girls also demonstrated earlier development in the brain regions responsible for impulse control, and, in general, matured earlier than boys (Viadero, 2006; Nagy Jacklin & Martin, 1999). However, the extent to which these biological differences manifested themselves in behavioral differences and had implications for teaching practices was unknown.

Social environment

An alternative group of explanations emphasized the role of social environmental variables, such as home and classroom factors, in academic development. Some authors (e.g., Newkirk, 2002) argued that boys fell behind girls academically in school, because classrooms were “feminized” environments, in which teacher attitudes, classroom rules, and learning tasks favored girls. Boys failed to invest in reading and writing because they perceived these as feminine activities. Factors that may lead boys to view literacy as a feminine activity included the prevalence of women in elementary teaching and as primary caregivers of children. In addition, boys’ preferences in reading materials were not reflected in the types of reading materials available in classrooms and libraries.

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