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Attitude Differences and Gender

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Attitude Differences and Gender in Science Education

In US secondary and postsecondary schools, it is common to hear talented female students telling their peers that they are "not a [math/science] person," even if their grades in these subjects suggest otherwise. Girls seem to develop this idea at a young age. Analyses of national data on US youth indicate that there are no notable gender differences in whether students "like science" in fourth grade, but differences emerge in eighth grade and grow stronger by 12th grade: 56 % of boys like science as compared with only 48 % of girls. This data shows that girls also have a greater tendency to report that they are not "good" at science (Bae et al. 2000, pp. 52–54). Fourth grade girls report being more likely to persist in science even if given a choice and less likely to consider science a "hard" subject, but this pattern is flipped by 12th grade, when 36 % of girls say they would not take more science (as compared to 30 % of boys) and 56 % say science is hard (as compared to 44 % of boys).

Studies suggest that gendered differences in attitudes toward science develop early, shaping female and male students' pathways from early exposure to science through their choice of career. Parents and teachers play a role in shaping children's gendered attitudes about science. When gender is salient in the classroom, preschool children appear to display preference for same-sex peers and exhibit behavior more closely in line with gender stereotypes (Hilliard and Liben 2010). When young people internalize the gendered messages they receive about certain career fields (e.g., science careers), they may steer away from areas in which they perceive that they are not expected to do well. Studies suggest that this pattern is heightened among the most mathematically and scientifically talented girls, representing a critical pool of potential "lost" scientific talent. These girls may consider their female identity to be mutually exclusive with a scientific identity. They may also be less likely to believe that they are indeed scientifically talented. Evidence suggests that girls develop lower assessments of their mathematical and scientific ability – irrespective of their observed ability – as compared to otherwise similar boys. These culturally influenced attitudes help to explain females' higher rate of selection out of the pipeline to scientific careers. Biased attitudes about gender and science tend to be implicit, but nevertheless can shape behavior – including engagement and achievement (Nosek and Smyth 2011).

These biased attitudes have important effects on the available labor pool of scientists. Even though girls and boys who choose postsecondary specializations in the physical sciences, engineering, mathematics, and computer science have similar profiles, overall girls seem more likely to choose postsecondary majors in male-dominated fields like biology, clinical and health sciences, and the social and behavioral sciences, even when controlling for ability (Perez-Felkner et al. 2012). Males remain more likely to complete doctoral degrees in these scientific fields than females, across all racial-ethnic groups. The persistence of this trend is perhaps even more puzzling considering recent and mounting evidence that women are outpacing men in educational attainment, an emerging global phenomenon. Importantly, promising research shows that enrolling introductory physics undergraduates in short values-affirming writing assignments narrows the gender gap in course performance (Miyake et al. 2010). In conjunction with related research on the negative effects of salient gender stereotypes on female students' performance on scientific tasks, these findings suggest that policy interventions aimed at affirming young women's place in the sciences might mitigate the negative

effects of persistent culturally influenced attitudes to the contrary.

Cross-References

- ▶ Achievement Differences and Gender
- ▶ Attitudes, Gender-Related
- ▶ Careers and Gender
- ▶ Gender
- ▶ Gender-Inclusive Practices
- ▶ Socio-Cultural Perspectives and Characteristics

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Attitudes to Science and to Learning Science

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Introduction

The study of school students' attitudes towards science and learning science has been a prominent feature of science education for 40–50 years. Concerns about declining attitudes have led to many studies of the possible influences on students' attitudes and of strategies that can be undertaken to improve attitudes.

The entry draws on five selected major review articles to demonstrate key findings from a range of studies and to explore the field for future reference. The first of these, by Osborne et al. (2003), sets out the main issues arising from an extensive review of the literature up to 2003. The authors explore what is meant by attitudes towards science, provide an overview of how attitudes have been measured, and discuss findings about the influences of gender and environment (including teaching) on attitudes and what is known about the relationship between attitudes and achievement. The second article by Barmby et al. (2008) provides additional analysis of and references to attitude studies, with specific commentary on a range of similar issues arising from their own research.

More recently, with reference to the Programme for International Student Assessment (PISA), where students' interest was a component of scientific literacy, the focus in reviews by Christidou (2011) and Krapp and Prenzel (2011) has shifted towards studies of students' interest in science. The relationship between attitudes and interest is explored from analyses presented in these two articles, together with further insights into the measurement of students' interest. Additional to this focus on interest, the work of Swarat et al. (2012) presents a more detailed investigation into students' interest in school science that could enhance our understanding of how school science can serve to influence students' attitudes.

Attitudes Towards Science: What Do We Mean?

Osborne et al. point out that there has been a lack of clarity of meaning with respect to attitudes. These authors draw on earlier work to make a distinction between attitudes towards science and scientific attitudes; the latter being "a complex mixture of the longing to know and understand, a questioning approach to all statements,