What Educators Need to Know About Encouraging Talented Girls in Mathematics

M. Katherine Gavin

If a girl who is extraordinarily gifted in math decides against math, the loss may be great indeed. She may have been the one to discover a new theorem; she may have been the one who found a way to understand gravity, or the cell; she may have had the happiness of doing the work for which she is uniquely suited.
— Barbara Kerr, *Smart Girls Two* (1994, p. 205)

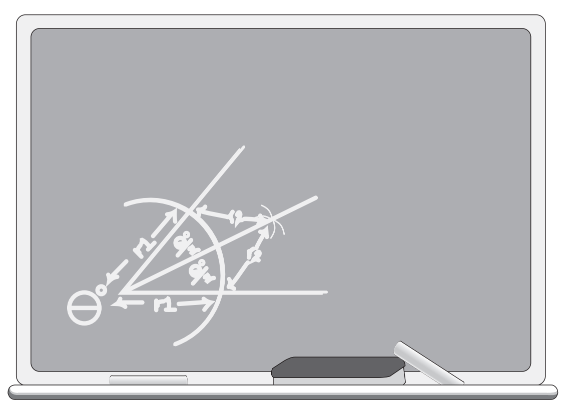
Practitioners' Guide A0022

Implications for the Classroom

Although we have made progress in ensuring that girls and boys have equal opportunity in school, we still have a long way to go. Research has demonstrated that teachers can make a positive difference in promoting confidence in mathematics in girls. In fact, teachers have been found to be the major source of influence on female's decisions to select mathematics as a college major (Gavin, 1996; Rossi Becker, 1994; Rogers, 1990).

High Expectations and Beliefs

Since gender bias is often subtle and unconscious, awareness of the problem is an important first step towards a solution. First and foremost, teachers must believe that girls **can** do mathematics and do it very well. This is especially true for African American and Latina females. Research has shown that an important barrier to their participation in mathematics is learning opportunity (Catsambis, 1994). Teachers need to make sure they recognize and promote mathematical ability in these students by recommending placement in appropriate courses and high-ability classes.



Teachers must maintain high expectations for girls and take personal responsibility for encouraging them in mathematics. Rather than trying to help by giving girls answers, teachers should encourage girls to solve problems on their own. This promotes self-confidence and research has shown there is a connection between confidence and mathematics participation and achievement

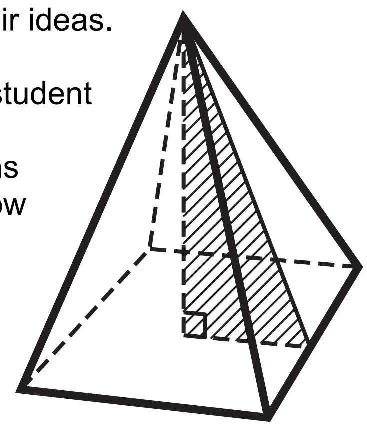
(Leder, 1992). Furthermore, girls talented in mathematics also exhibit less self-confidence than their male counterparts (Siegle & Reis, 1995; Terwilliger & Titus, 1995). They need to be recognized as experts and given awards and opportunities to extend their learning accordingly.

Cooperative Versus Competitive Settings

Research has found cooperative learning to be especially helpful to girls (Peterson & Fennema, 1985). This works best when the situation calls for true collaboration, so that the group needs each other to solve the problem and all are responsible for one another's learning. Often in coed groups, boys tend to dominate and girls become the recorders rather than the thinkers and doers. For this reason, teachers should consider single gender groups.

Accommodating Learning Styles

Teachers should recognize a variety of learning styles and capitalize on students' strengths. Research has shown that girls are less risk-taking than boys (Fennema, 1990). One way to help girls gain confidence in their ability and participate more in class is to use the think-pair-share strategy. This technique gives students the opportunity to first formulate their own conjectures with some quiet think time. Next, students are paired together to test their ideas out with a peer. Finally, a whole-class discussion takes place in which students are now more willing to reveal their ideas.



It is also important to consider learning styles when evaluating student knowledge. Alternative assessments including integrated performance tasks, journals, portfolios, and pictorial explanations are all valid ways of demonstrating understanding and often allow females to showcase their mathematical talent better than traditional tests.

Making Connections

Teachers must connect mathematics to the daily lives of their students showing its relevance and usefulness. Practical situations not only stimulate interest, but also allow students to value mathematics and see the need to continue their studies in this area. This coincides with the focus placed on mathematical connections in the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics, 1989).

Female Role Models

eachers should provide female role models who embody confidence in mathematics and have an affinity for the subject. This needs to start with the teacher and can extend to studying famous women mathematicians. It may also be possible that students, both males and females, are not pursuing mathematics in college and beyond because they are not aware of the career opportunities available to them in this field. Teachers need to learn about career options that are open to mathematics majors and inform all students of these opportunities.

Research has shown that female African Americans and Latinas are the least likely to aspire to careers in mathematics and science-related fields (Catsambis, 1994). Mentorship programs can be particularly effective with girls and minority students when they are placed with a role model of the same gender or race. Because girls often believe careers in mathematically related fields are reserved for White males, they need to interact with female role models in high-level positions, especially in technical fields that involve strong mathematical backgrounds (Sheffield, 1994).

Finally, as Shulman (1994) suggests, teachers need to shift to a more feminist pedagogical approach. A view of mathematics based on conjecture and discovery, a state of incompleteness rather than a set of rigid rules, and a shift from product to process, will appeal to both female and male students and enliven our classrooms with a zest for both learning and creating mathematics.

Research Facts

- In classroom interactions, teachers call on boys an average of 8 times more than girls. Research has shown that increased teacher attention, whether praise or criticism, contributes to enhanced student performance (Sadker & Sadker, 1994).
- Hands-on, active involvement in learning and doing mathematics is important for girls to see the usefulness of the subject and gain confidence in their ability (Fennema & Sherman, 1977, 1978).
- Although the gender gap in mathematics is decreasing, there is still a marked difference in performance between the top students. In fact, an American Association of University Women report (1992) found that "all differences in math performance between girls and boys at ages eleven and fifteen could be accounted for by differences among those scoring in the top 10 to 20 percent" (p. 25).
- Standardized test results still reflect a gender difference, especially highstakes tests like the SATs. Males continue to outperform females on both the mathematics and verbal sections of the SAT, earn higher advanced placement test scores, and are more likely to receive college credit for high school courses (Sadker, 1999).
- Although girls are participating more in higher level math courses including calculus, they often view mathematics as cold and impersonal and endure it rather than enjoy it (Sadker & Sadker, 1994).
- Females frequently drop out of mathematics in college or decide not to pursue a career in quantitative fields (Gavin, 1997; Linn & Kessel, 1995). The participation of females in physics and engineering reached a plateau of 15% in 1986 and has remained at this level throughout the 1990s, yet the demand for jobs in these arenas continues to increase (Campbell, 1996).
- A new gender gap exists in technology. Girls have less computer experience and are less comfortable with computers than boys. In school, girls often enroll in word processing courses, while boys take advanced computer science courses (Sadker, 1999).

π=3.14159265358979323846

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Organizations

American Association of University Women
1111 Sixteenth Street NW
Washington, DC 20036-4873
(800) 326-AAUW
info@aauw.org
www.aauw.org

The Association for Women and Mathematics (AWM)
4114 Computer & Space Sciences Building
University of Maryland
College Park, MD 20742-2461
(301) 405-7892
awm@math.umd.edu
www.awm-math.org

EQUALS Programs
Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200
(510) 642-1823
equals@uclink.berkeley.edu
equals.lhs.berkeley.edu

Math/Science Network
Mills College
5000 MacArthur Boulevard
Oakland, CA 94613-1301
(510) 430-2222
msneyh@mills.edu
www.expandingyourhorizons.org

National Coalition for Women and Girls in Education
National Education Association
1201 Sixteenth Street NW
Washington, DC 20036
(202) 833-4000
www.nea.org

National Women's History Project
7738 Bell Road
Windsor, CA 95492-8518
(707) 838-6000
nwhp@aol.com
www.nwhp.org

Women's Educational Equity Act (WEEA) Publishing Center
Educational Development Center, Inc.
55 Chapel Street - Suite 200
Newton, MA 02158-1060
(800) 225-3088
weeapub@edc.org
www.edc.org

Women and Mathematics Education
SummerMath
Mount Holyoke College
50 College Street
South Hadley, MA 01075-1441
(413) 538-2608
summermath@mtholyoke.edu
www.mtholyoke.edu/proj/summermath

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