Equity in science begins in the classroom. Do you treat boys and girls differently?

Research in science classrooms around the country during the last 20 years reveals the following patterns of teacher-student interaction and resulting traits in students:

- **Classroom interactions.** Boys report a greater willingness to speak up in class or argue with the teacher when they think they are right. (2) If a boy calls out in class, he is more likely to get the teacher’s attention, especially intellectual attention. If a girl calls out in class, she is more often told to raise her hand before speaking. Boys interact more with teachers than with girls, girls have many more days in which they do not interact at all with the teacher. Teachers initiate far more physical and verbal contacts with boys, and boys receive more discipline, as well as more praise. (4)

After calling on a student, teachers tend to keep calling on students of the same sex. While this pattern applies to both sexes, it is far more pronounced with boys, giving them more than their fair share of air time. Teachers are twice as likely to encourage male students to complete tasks for themselves. With female students, teachers are more likely to complete a task for them instead. As a result, boys learn to become independent learners, while girls become more dependent learners, a phenomenon known as "learned helplessness." (4)

- **Less encouraging attitudes in girls.** Boys attribute their failures in math and science to a lack of effort, whereas girls attribute their failures to a lack of ability. This causal attitude difference decreases girls’ self-confidence and subsequent achievement. (5)

- **Examples used by teachers.** Classroom activities are more often chosen to appeal to boys than to girls; guest speakers are often white male scientists; and the classroom atmosphere is likely to be competitive—factors that tend to discourage girls and minorities. (6)

- **Expectations.** Teachers ask male students more higher-order questions and female students more lower-order questions. (7)

### Equity in science class

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As a nation striving to achieve excellence in education, we cannot afford to ignore the needs of our students. In today’s competitive marketplace, equitable treatment in the classroom is necessary to prepare students for tomorrow’s workforce. We will not be able to meet these needs without developing the skills and talents of all students. Educational research provides many insights into the process of creating a supportive and equitable classroom atmosphere. Here are some of the answers that research gives us.

**The problem**

In 1989, women earned 26 percent of the doctoral degrees in science and engineering. (1) Women attain doctoral degrees at a lower rate than men in all fields of science except psychology. According to an American Association of University Women survey released last year, sixth- through ninth-grade girls suffer from low self-esteem and poor attitudes toward math and science, thereby prematurely narrowing their career choices. Pre-adolescent girls have high self-esteem, but by the time they reach high school, their self-esteem drops significantly, along with their interest in math and science. (2)

Differential treatment of boys and girls can result in discriminatory school experiences and limit future opportunities. Female students who have had discriminatory school experiences are less likely to enter a scientific or science-related job and have confidence in their science ability. Males are also victims. Quiet, passive, or unathletic boys can suffer socially or psychologically, for boys are stereotyped earlier and more harshly than girls. Also, boys with an interest or talent in ballet, nursing, elementary teaching, or homemaking are more likely to suppress these interests. (3)

Active, independent, and aggressive behavior, most often exhibited by boys, conflicts with typical school norms, and therefore boys are disciplined more often and more severely than girls, even when both misbehave in similar ways. Boys are more likely to be referred to school authorities than are girls. Boys are more likely to repeat grades and receive lower grades than girls. (3)

**How it happens**

The differential treatment that teachers give students is often subtle and, as a result, is difficult to detect, much less change. Teachers seldom deliberately treat boys and girls differently. Instead, their behavior is often unconscious, and therefore unexamined. Teachers are products of their culture, and so are their attitudes and behaviors. Their verbal and nonverbal communication conveys messages about expectations, evaluations, and performance.
analysis viewpoint favored by boys. Thus, girls feel less comfortable approaching laboratory experiences when they don’t understand the relationship of one experiment either to another experiment or to a life experience. If, as research suggests, females learn better in a cooperative, rather than a competitive environment, then scientists should be introduced as individuals wholly integrated with other aspects of daily life (Rosser, 1990).

Baker (1983) contends that there is a conflict between science and the definition of femininity. Other researchers point to a male bias in the choice and presentation of scientific problems (Harris, Silverstein, and Andrews, 1989), and in the design and interpretation of scientific work.

Be Part of the Solution
In order to draw a higher proportion of girls and minorities toward science careers, we must begin by evaluating our own classroom behavior with respect to race and gender discrimination. After that self-examination, consider the following guidelines for structuring science activities that motivate and respond to the interests of all students.

1. Choose activities that are free from sexual stereotyping.
2. Spend instructional time on science activities every day.
3. Design activities that will ease the stress of competition.
4. Feature the use of simple science tools in your activities.
5. Emphasize the practical applications of science and how it relates to students’ lives.
6. Include a wide variety of science topics and concepts in order to reduce anxiety.
7. Present data on both males and females, whether the subjects are animals or humans, in all laboratory experiences.
8. Give equal feedback to females, males, and minorities when working with science problems.
9. Make a conscious effort to acknowledge the contributions of female and minority students and scientists to scientific observation.

It’s in Your Hands
In the future, more and more jobs will require a high level of science knowledge. As the demand increases for workers with science skills, any underrepresentation of gender and race subgroups will become more problematic.

Listen to the recommendations of the research done thus far, and call for additional studies that explore these questions in greater depth. Plan science activities that nurture scientific literacy in your female and minority students, so that all your students will be ready to meet the demands of the future.

Resources