Are You Turning Female and Minority Students Away from Science?

By Sally Blake

As science educators, we all believe that the leaders of tomorrow—who sit in our classrooms today—should possess a high degree of science literacy. In fact, the entire citizenry must be prepared to vote and act responsibly in our highly technological society. For this reason, we involve our students in hands-on learning and activities that attract them to science and then sustain their interest.

But something’s not working, at least it’s not working with certain segments of the student population. Female and minority students are not keeping up with their counterparts in science, and we’ve got to do everything we can to combat that dangerous trend. After all, we need to nurture every child’s science potential because neither we nor they can afford to lose their future contributions.

The Gender and Race Gap
Currently, females and minorities continue to be underrepresented in science-related employment (Task Force on Women, Minorities, and the Handicapped in Science and Technology, 1989). Studies reveal that, in 1988, females and minorities represented only 33 percent and 2.6 percent, respectively, of all scientists (National Science Foundation, 1990). Consider those numbers in the light of estimates for the year 2000, when 66 percent of those entering the workforce will be women and 30 percent will be minorities (Southern Growth Policies Board, 1988). Clearly, we’ve got to act now to ensure that all of our students have the same opportunities and learning experiences during their years of science education.

Early Disparities
The National Assessment of Educational Progress (NAEP) data show substantial disparities in science proficiency among subgroups defined by race/ethnicity and gender. While average proficiency for nine-year-old boys and girls is approximately the same (except in the physical sciences), a performance gap becomes evident at age 13 and increases by age 17. In 1986, the mean score for 13-year-old males was 227.3, compared to 221.3 for 13-year-old females (National Science Foundation, 1990). The mean score for nine-year-old black children was 196.2, while white children averaged 231.9. These data reflect the fact that differences in science achievement seem to begin at the elementary level (Mullis and Jenkins, 1988).

Not Enough Science
A contributing problem may be the lack of emphasis on science during the elementary grades. Then, the time devoted to science is less than half that devoted to reading and mathematics (Mullis and Jenkins, 1988).

Yet the problem is even worse for girls and minorities. Data from the NAEP also indicate that girls have significantly less science experience than
Are these curious students being encouraged to study science?

boys at comparable ages. Mullis and Jenkins (1988) note that white students are consistently more likely to report having used various scientific apparatuses than are minorities. Specifically, minorities were less familiar with such simple devices as scales and magnifying glasses. Unfortunately, low-income and minority students are also less likely to have qualified science teachers (National Science Teachers Association, 1990/1991).

“Invisible” Students?
The comparative lack of successful female and minority scientists cannot be traced to any single factor but certainly stems from insufficient academic support, including negative signals that discourage girls and minorities from developing their science abilities (Mullis and Jenkins, 1988). Data collected from programs that attempt to recruit and retain minorities of both sexes suggest that minority females turn away from science for some of the same reasons that white females do. Kahle (1985) and Cambell (1986) have described teachers’ instructional effectiveness as significant in attracting girls to science, yet very little research has centered on comparing the relevant teaching methods and approaches.

We must be aware of the link between the overt curriculum, which is observable, and our hidden curriculum, which may affect your teaching more subtly (Sapiro, 1990).

The way that you verbally interact with your students may unconsciously discourage female and minority participation (Rosser, 1990). For example, you may promote the “invisibility” of females by subtle practices, such as calling directly on males but not on females. Studies indicate that teachers do address males by name more often than females, and they also give males more time to answer questions (Association of American Colleges, 1982). Girls, particularly black girls, get less feedback than boys (Irvine, 1986), and minority students often feel ignored or put down by teacher response and instruction (Noonon, 1980).

Addressing Gender Bias
Examining gender bias in the classroom, researchers have isolated several contributing factors. Gilligan (1982) concludes that girls approach problem solving from the perspective of interdependence and relationship rather than from the isolated skill
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
Association of American Colleges. (1982). The classroom climate: A chilly one for women? Washing-
ton, DC: Project on the Status and Education of Women.


With encouragement, all your elementary students can become scientists.


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