

**Patricia Blanton, Column Editor**  
Department of Physics and Astronomy, Appalachian State  
University, Boone, NC 28608; blantonp@apstate.edu



## Gender in the Physics Classroom

**Laura McCullough**, University of Wisconsin–Stout, Menomonie, WI

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**Column Editor's note:** Laura McCullough teaches physics at the University of Wisconsin–Stout. She has a Ph.D. in science education and conducts physics education research on gender issues in physics. I was impressed with her passion for this issue when I heard her speak at an AAPT session several years ago, and I think you will agree that the insights she shares here can help all of us to insure equity for all students we teach.

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Recent reports<sup>1</sup> have emphasized the need for increased science participation in our schools. In our technology-centered society, every student needs to understand science simply to function. We also need to encourage more people to enter science careers in general and physics in particular. As part of that we need to make better use of a large talent pool available that is underutilized in the United States: women. Women are a minority in physics programs, making up about 21% of physics baccalaureate degree holders and 14% of Ph.D.s.<sup>2</sup> We are making some progress: about half of all high school physics students are young women, although they are less commonly found in advanced physics courses. We should, however, be making more progress.

For a new teacher, worrying about gender in the physics classroom might seem like one more weight piled on top of an already heavy load. With all the things to do and learn,

couldn't this one wait until you're settled in at least? The answer is no. As individuals and as a society, we need to vigorously promote women's participation in science and technology. And the classroom and teacher have a profound effect on a student's inclination to study a subject. We can't afford to wait a year or two, and we can't afford to let any more potential scientists slip away.

Teachers provide role models for students in their subject areas and their lives. Because only about 31% of high school physics teachers and 13% of physics faculty are women, we need to provide other female physics role models. We can do that through the physicists we mention, the language we use, and the illustrations we show.

So, how do we make a difference? What are the classroom issues with regard to physics and gender? Research conducted over the last 20 years suggests many issues that need addressing.

• **Group work:** This can be problematic for underrepresented groups. Two men may ignore a single woman in their group, even if she is better at physics. Young men may dominate lab work and experimental activities, relegating a young woman to the note-taking role. Thoughtful grouping by the teacher and careful control over the roles played by group members is an important avenue for addressing this concern.

• **Selective attention to one gender:** Significant research has been conducted in classrooms showing that teachers pay more attention to boys. This includes both positive and negative interactions. The best way to find out if you are paying more attention to any one group is to arrange to be observed. This helps not just with gender but with any group (e.g., women, the right half of the class, or whites).

• **Language and visual presentation of physics:** A subtle message can be given to students when every problem involves Mack trucks or power tools. These stereotypically male contexts can tell girls that physics is not a woman's field. Modern textbooks are fairly good at representing a diverse group in their

pictures, but contexts of problems may still be stereotypical. One way to create problems that reach all audiences is to use “you” as the protagonist rather than John or Sally. Also, use contexts that all students are familiar with: school activities, food, cars.

There’s a lot a new teacher can do, and being aware of the issue is the most important step. Awareness will filter into your own actions and activities.

Many of these strategies are also valuable for promoting participation by other underrepresented minorities such as Hispanics and blacks, populations who make up another large source of underutilized science talent.

Physics teachers play an important role in our students’ continuing involvement in physics. This is something we need to be especially aware of for our young women because of the continuing underrepresentation of women at almost every level. An awareness of gender issues in the physics classroom and a few simple actions on the teacher’s part can do a lot to make the physics classroom a place for promoting women’s participation, not hindering it.

### Helpful resources on gender in the physics classroom:

- C.-S. Davis et al., *The Equity Equation* (Jossey-Bass, San Francisco, 1996).
- S. Rosser, *Female-Friendly Science* (Pergamon Press, New York, 1990).
- The Gender & Science Digital Library. Available at <http://www.gsdl.org>.
- MERLOT: Multimedia Educational Resource for Learning and Online Teaching. Available at <http://www.merlot.org>.

### References:

1. National Academy of Sciences, *Rising Above the Gathering Storm: Energizing and Determining the Curie temperature of iron and nickel gizing and Employing America for a Brighter Economic Future* (National Academies Press, 2006). Available at <http://www.nap.edu/catalog/11463.html>
2. “Women in Physics” (AIP, 2005). Available at <http://aip.org/statistics/trends/gendertrends.html>.