Study urges high school science teachers to balance verbal interactions with boys, girls

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As high school science teachers return to their classrooms to begin a new school year, scholars from Northern Illinois University are urging them to talk more to girls.

Otherwise, the College of Education researchers warn, the United States will struggle to meet its scientific and technological ambitions for the future.

Science teachers spend 39 percent more class time directly addressing boys, according to NIU's federally funded Science-in-the-Moment (Sci-Mo) research. Over the course of a month, it adds up to 40 minutes. That's nearly the equivalent of an entire class period.

Compounding the problem is that girls already are bored, disengaged and stressed in science classes when compared to boys.

Consequently, while many girls earn good grades in science, they still feel less competent than they actually are. Worse, girls drift off further when the challenge of the material rises.

It's apparent that many of those feelings originate from the front of the classroom and, unfortunately, can give girls misperceptions of their true abilities that hamper their long-term interest and persistence in science.

What's encouraging, however, is that teachers aren't consciously or intentionally creating the disparity. Even better, they'll soon have access

to free books and other materials to help them reverse course.

“There is hope. Teachers are amenable to change. They don’t want there to be differences in how they teach different genders. They don’t want this to be the case,” said Lee Shumow, a professor in NIU’s Department of Leadership, Educational Psychology and Foundations and a senior researcher on the Sci-Mo project.

“Simple awareness is extremely important. You can’t deal with a situation if you don’t think it exists.”

“We want schools and teachers to be aware,” said NIU professor Jennifer Schmidt, who led the Sci-Mo research with colleague M Cecil Smith. “Their students are not having the same experiences.”

Schmidt and Shumow now are the principal investigators on a new, three-year $375,000 dissemination grant from the National Science Foundation to create professional development materials.

Called ETEAMS – Empowering Teachers to Enhance Adolescents’ Motivation for Science – the grant funds production and distribution of a book, video vignettes that demonstrate best practices and a website. All will be available to teachers at no cost.

The new dollars stem directly from the impressive success of Sci-Mo, a $476,000 grant from the NSF that allowed NIU researchers to study 244 high school students and 13 science teachers in a dozen classrooms at one school during the 2008-09 academic year.

On a quest to help science teachers design and deliver lesson plans that best engage and electrify girls as well as boys, Schmidt, Smith, Shumow and their team discovered that classroom discussions are the only activity to score among the top three “favorites” for both genders.

Yet after watching 100 hours of video shot in the 12 classrooms to dissect "every utterance from the teachers' mouths," researchers now know that the optimum way to connect with all science students is typically relegated to less than 2 percent of classroom time.

Perhaps more distressing: Great amounts of time are "wasted."

For example, nearly a quarter of every class period is consumed by non-instructional classroom management and off-task activities. Time spent moving the lesson along – "Turn your books to Page 47," for example – similarly depletes valuable minutes: sixteen minutes of a typical 50-minute class session.

In short, teachers already are losing more than half of each period to work other than teaching.

While teachers unknowingly bypass opportunities to promote critical thinking skills or demonstrate practical applications of science knowledge, students feel they're not learning anything or doing "real" science.

And, as teachers unconsciously direct more of their instruction to boys, girls respond by simply tuning out.

"Science is a national priority now," Schmidt said, "but if we don't get our youth excited about it, we're never going to achieve many of our goals."

Many teachers who seem to believe that unmotivated students pose a helpless situation must understand that is not true, Shumow added.

"In interviews with the teachers, their seeing motivation as a trait – rather than a state – really jumped out and struck me," she said. "We're

trying to change that and convince them that there is something they can do about it."

First, they advise, teachers should remember and reconnect to the best-practice methods advocated in science teacher preparation programs. Second, those preparation programs should enhance curriculum regarding learning differences by gender.

Third, Shumow said, schools should reduce and limit the amount of interruptions a teacher faces each day. Some teachers are forced to switch classrooms between class periods, a hassle that gobbles up opportunities to prepare lessons or meet with students individually.

NIU's researchers are now at work on a book will finally answer the question they have heard again and again from teachers regarding the project: "This is wonderful! Where's the manual?"

National experts in science, education, gender and motivation are helping to guide that latest task, funded through a new dissemination grant from NSF. The group convened on the NIU campus in July.

"The enthusiasm from the panelists was so great," Schmidt said.

"We got a lot of valuable recommendations about the types of language we should use in our books – phrases that turned the teachers off or suggested something different to academics than they do to classroom teachers," Schmidt added.

"Teachers also shared some details about the constraints placed upon them in their daily instruction, and this will help us better craft realistic recommendations for practice."