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FOR IMMEDIATE RELEASE:**April 19, 2011**

Harvard Study Shows that Lecture-Style Presentations Lead to Higher Student Achievement

Widely-used problem-solving pedagogy as implemented in practice is not as effective for raising achievement levels

CAMBRIDGE, MA – A new study finds that 8th grade students in the U.S. score higher on standardized tests in math and science when their teachers allocate greater amounts of class time to lecture-style presentations than to group problem-solving activities. For both math and science, the study finds that a shift of 10 percentage points of time from problem solving to lecture-style presentations (for example, increasing the share of time spent lecturing from 60 to 70 percent) is associated with a rise in student test scores of 4 percent of a standard deviation for the students who had the exact same peers in both their math and science classes – or between one and two months’ worth of learning in a typical school year.

These estimates are based on the actual implementation of teaching practices that the researchers observe in practice. Thus, while problem-solving activities may be very effective if implemented in the correct way, simply inducing the average teacher employed today to shift time in class from lecture style presentations to problem solving, without concern for how this is implemented, contains little potential to increase student achievement. On the contrary, the study’s results indicate that there might even be adverse effects on student learning.

Guido Schwerdt, a postdoctoral fellow in Harvard’s Program on Education Policy and Governance, and Amelie C. Wuppermann, a postdoctoral researcher at the University of Mainz, Germany, conducted the study. A research article, “Sage on the Stage,” presenting the study’s findings will appear in the Summer 2011 issue of *Education Next*.

The researchers used data from the 2003 Trends in International Mathematics and Science Study (TIMSS). Their sample includes 6,310 students in 205 U.S. schools with 639 teachers (303 math teachers and 355 science teachers, of which 19 teacher both subjects). In addition to test scores in math and science, the TIMSS data include information on teacher characteristics, qualifications, and classroom practices. Most important for the analysis, teachers were asked what proportion of time in a typical week students spent on each of eight activities, and the authors’ methodology focused on three of these activities -- listening to lecture-style presentations, working on problems with the teacher’s guidance, and working on problems without guidance -- as a “good proxy for the time in class in which students are taught new material.” They divide the amount of time spent listening to lecture-style presentations by the total amount of time spent on each of these three activities to generate a single

measure of how much time the teacher devoted to lecturing relative to how much time was devoted to problem-solving activities.

Schwerdt and Wuppermann observe that in recent years, a consensus has emerged among researchers that teacher quality “matters enormously for student performance,” but that relatively few rigorous studies have looked inside the classroom to see what kinds of teaching styles are the most effective. Their study of teaching styles finds that “teaching style matters for student achievement, but in the opposite direction than anticipated by conventional wisdom: an emphasis on lecture-style presentations (rather than problem-solving activities) is associated with an increase -- not a decrease -- in student achievement.” They report that prominent organizations such as the National Research Council and the National Council of Teachers of Mathematics, for at least the last three decades, have “called for teachers to engage students in constructing their own new knowledge through more hands-on learning and group work.” The emphasis on group problem-solving instructional methods has been incorporated into most U.S. teacher preparation programs, and the authors found that teachers in the study’s sample allocated, on average, twice as much time to problem-solving activities as to lecturing, or “direct instruction.”

The researchers recognize that a key challenge in studying the effects of teaching practices is that “teachers may adjust their methods in response to the ability or behavior of their students,” perhaps relying more on lectures when assigned more capable or attentive students. To address these concerns, they “exploit the fact that the TIMSS study tested each student in both mathematics and science,” which allowed them to compare the math and science test scores of individual students whose teacher in one subject tended to emphasize a different teaching style than their teacher in the other subject. They found that in both math and science, the positive relationship between lecture-style methods and test score gains was maintained. The estimated .04 standard deviation impact of a greater emphasis on lecturing is based on students who had the same peers in both classes, because that minimizes the chances that teaching styles -- and their consequences -- might differ depending on the composition of the class.

About the Authors

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Education Next is a scholarly journal published by the Hoover Institution that is committed to looking at hard facts about school reform. Other sponsoring institutions are the Harvard Program on Education Policy and Governance, part of the Taubman Center for State and Local Government at the Harvard Kennedy School, and the Thomas B. Fordham Foundation.

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