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Classroom Connectivity in Promoting Mathematics and Science Achievement Research Project

Background

Texas Instruments TI-Navigator technology with teacher professional development linked to higher Algebra I student achievement according to a study by the Classroom Connectivity in Promoting Mathematics and Science Achievement Research Project

Summary of Results

Algebra I students whose teachers used [TI-Navigator™](#) networked mathematics classroom technology from Texas Instruments, achieved higher test scores according to initial findings from the Classroom Connectivity in Promoting Mathematics and Science Achievement [Research Project](#). The independent research also indicates that the impact of the TI-Navigator classroom network system on teacher effectiveness, together with sustained training on the technology's use, is equivalent to 10-15 years of teaching experience in Algebra I. The TI-Navigator system connects students' TI graphing calculators to the teacher's computer, enabling shared learning experiences.

Research Background

In the four-year national study from 2005-2009 funded by the Institute of Education Sciences (IES) and U.S. Department of Education, teachers for the first year were randomly assigned to use or not use the TI-Navigator system in their classrooms. Those using the [technology](#) received professional development training during a one-week, residential summer institute and also attended the Texas Instruments [Teachers Teaching with Technology™](#) (T³) annual conference each year they participated in the study.

Gains in Algebra 1 Student Achievement

The researchers enrolled 127 Algebra I teachers from 28 states and 2 Canadian provinces, and 1,761 students in the first year of the study. In that year, students with complete data of those teachers using [TI-Navigator](#) scored 10 percentage points higher on a researcher-designed Algebra I test, compared to those students with complete data taught by teachers not using the connected classroom technology. Teacher knowledge about students as a result of professional development and use of the [TI-Navigator](#) system was related positively to student performance, and students held higher expectations for their mathematics achievement. The results of the research did not connect these outcomes with frequency of connected classroom technology implementation or level of instructional change made with the technology.

During the next three years, the approximately 3,300 students in [TI-Navigator](#) classrooms produced annual achievement gains in the range of 6 to 14 percent, according to at least one analysis approach and with one exception. Students who scored higher on the Algebra I test did better regardless of teacher experience or differences in student ability versus the non-TI-Navigator control group.

“In a normal mathematics classroom, students say, ‘This is math, I have to do it,’” said Dr. Douglas T. Owens, an education professor at The Ohio State University and the project’s Principal Investigator. “In a connected classroom, students say, ‘This is math, and I understand it. I can do it.’” Students are engaged with the activities in the classroom and with the tasks the teacher has set.”

Change in Algebra 1 Classroom Discourse

The researchers also investigated the interactions in 33 Algebra I classrooms in nine states of those teachers using the TI-Navigator system. A preliminary analysis of this subset of teachers suggests a change in the questioning patterns in typical mathematics classrooms, which often are dominated by teacher-led dialog that require short responses of known information from students. While both treatment and control classrooms were dominated by these types of interactions, control teachers asked more questions overall than those with the [TI-Navigator](#) system in their classrooms, and these questions typically elicited lower-order responses from students, such as statements about calculating the correct answer without explaining the underlying mathematical reasoning. The study also found a trend toward teachers using the TI-Navigator system providing longer mathematics-related comments in the classroom.

When researchers examined the relationship between teacher-student interaction and student achievement, their initial findings indicate that student achievement is associated with teacher behaviors that require mathematical thinking. Achievement was positively related to the ratio of higher-order to lower-order questions and the number of words uttered by students when making mathematical statements regardless of whether the technology was being implemented in the classroom. Higher order questions, in part, involve the combination of facts and ideas to arrive at a conclusion or interpretation.

Research Funding & Support

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