The Scaling Up SimCalc Project

Background

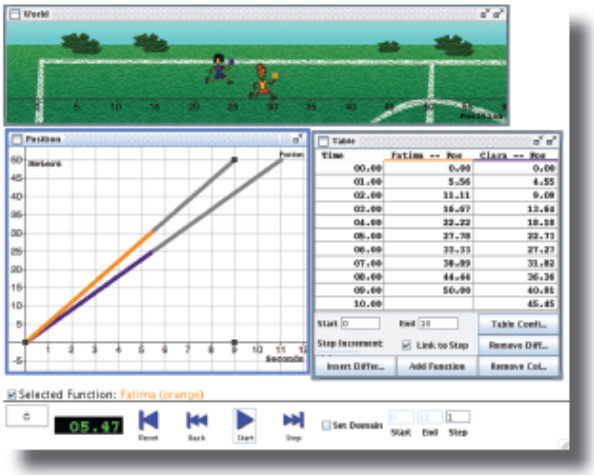
This project investigated the scale-up of an innovative integration of technology, curriculum, and teacher professional development aimed at improving mathematics instruction in grades 7 and 8. The SimCalc approach integrates teacher professional development, curriculum and software called SimCalc MathWorlds.

The project builds on an almost 30-year research program. Dr. James J. Kaput, Ph.D. of the University of Massachusetts, Dartmouth designed the SimCalc program in the late 1980s to achieve his vision of "democratizing access to the mathematics of change," i.e., making concepts of proportionality, linearity and rates of change accessible to middle school students of all cultural and demographic backgrounds. Through use of interactive software, the SimCalc program advances student learning of proportionality beyond the traditionally taught cross-multiplication procedure.

The SimCalc MathWorlds Software and Curriculum

SimCalc is an interactive software-based curriculum that supports students in developing a robust, integrated, multi-faceted understanding of the concept of "rate of change."

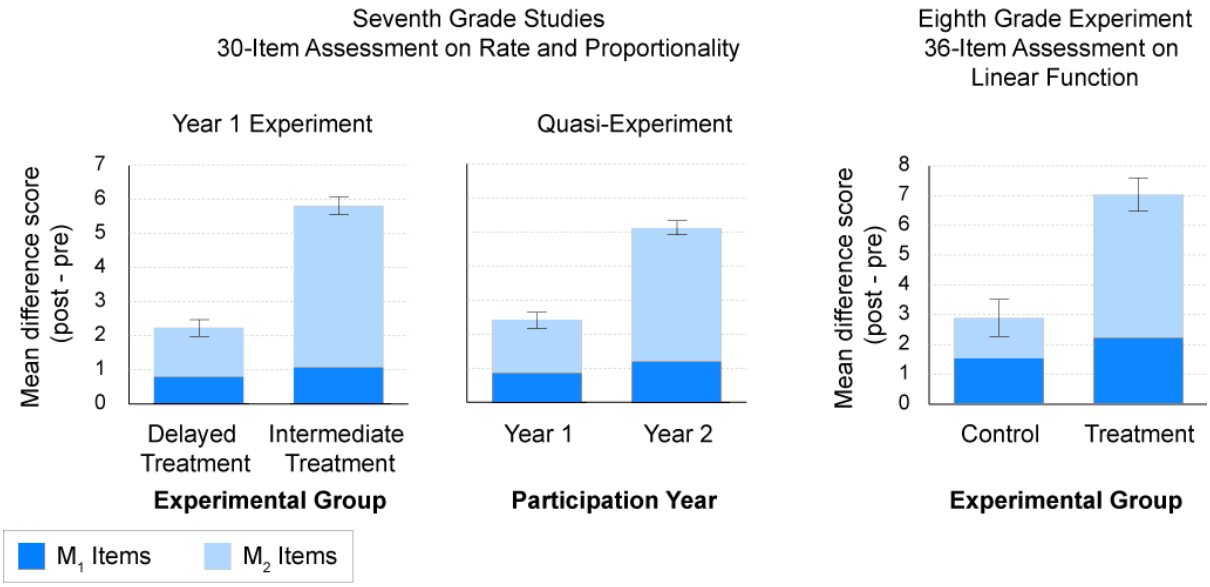
- Engages students in creating and analyzing graphs that control animation
- Anchors students' learning of complex mathematics in everyday situations
- Connects students' understanding of rate and proportionality across key mathematical representations, stories and animations
- Integrates curriculum, software, and teacher professional development
- Structures pedagogy around making predictions, testing predictions, and explaining any differences



In one 7th grade activity, students control two runners by adjusting the slopes of the colored lines in the graph. By running the animation students see how slope relates to speed.

Documented Results

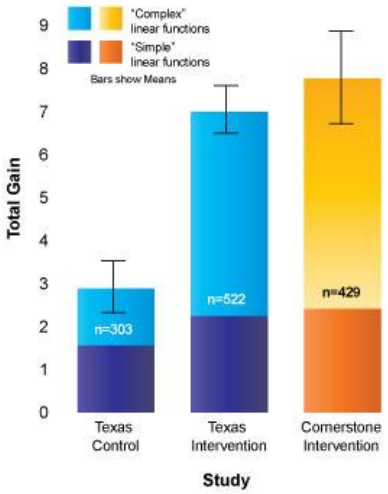
Across three large-scale studies in the state of Texas, we replicated a strong main effect demonstrating that SimCalc enables a wide variety of teachers in a diversity of settings to extend students' learning to more advanced mathematics. In each study, teachers in the treatment group taught with a 3-week replacement unit that used the MathWorlds software; the control group taught the same content using their traditional curriculum. For the seventh-grade study, the seventh-grade quasi-experiment (delayed treatment teachers across years 1 and 2), and the eighth-grade study, the main effects were statistically significant and showed that students in the treatment group (or year 2) learned more than students in the control group (or year 1). Student-level effect sizes of .63, .50, and .56, respectively.



*We measured learning for two types of items: **M**$_1$ items measured the foundational concepts typically covered in the grade-level standards, curricula, and assessments. **M**$_2$ items measured understanding of essentials of concepts of mathematics of change and variation found in algebra, calculus, and the sciences.*

Scaling and Adaptation within the US and Beyond

While the first study took place in the state of Texas, we have since successfully scaled and adapted our approach for use in the state of Florida and the UK. The Cornerstone Maths project adapted our curriculum for grade 8 students for students in England's key stage 3 (similar to middle school), showing comparable results in learning.



For More Information

For publications and free downloads of software and curricula: http://math.sri.com/

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