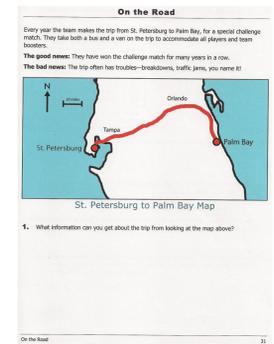




# Scaling Dynamic Mathematics Reform: Findings from the SunBay Pilot Study

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## Introduction

This poster reports on the efforts of the SunBay Digital Mathematics Project (SunBay) to create the links needed to use collaborative digital technology to improve the teaching and learning of conceptually focused middle school mathematics in a large, urban school district (SRI International & University of South Florida St. Petersburg, 2010). SunBay is a partnership among a college of education, a public university, a school district, and a non-profit research organization; each organization providing complimentary expertise to the project. The long-term goal of the project is to implement a dynamic, digital middle school mathematics curriculum that will democratize access to the complex mathematics of change and variation, and create a more coherent and fruitful mathematical experience for all learners, including those who have not traditionally been successful in mathematics. As such, SunBay intends to help pioneer the future of mathematics education by creating a national model where every middle school mathematics teacher in the participating district has the knowledge and support to use technology to become an effective teacher of dynamic mathematics.

## Method

The SunBay pilot investigation was conducted according to the principles of mixed method research (Creswell, 2003; Tashakkdori & Teddlie, 2003). Team members collected different forms of data ranging from observation notes to student assessments in order to track the project's progress over time. The goal of this effort was to construct a shared, empirically-based perspective—albeit with varying levels of agreement—about teachers' response to the PD and their use of SimCalc MathWorlds® in the classroom. These data were analyzed as part of the SunBay team's continuous improvement effort to adapt SimCalc to the local context, to gauge student learning of important mathematics, and to design professional development that met the teacher participants' needs. Member checks were conducted with university, non-profit, district participants, and the 13 teachers. Table 1 lists the data collected in the SunBay pilot study.

## Acknowledgements

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## SimCalc Mathworlds

### Workbook Sample: Managing the Soccer Team: On the Road<sup>2</sup>

3. The trip from St. Petersburg to Palm Bay two years ago went fairly well.

a. Looking at the graph, *predict* which vehicle arrived first.

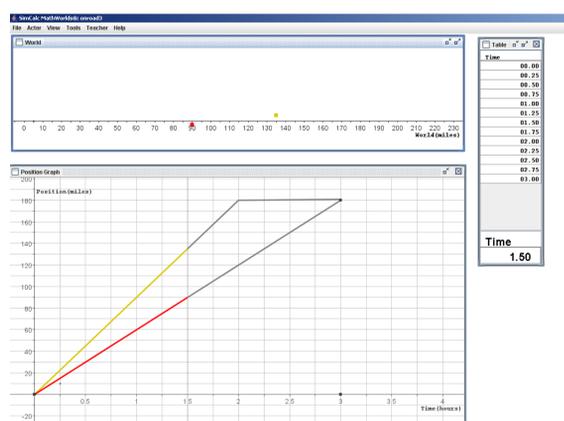
b. How long did it take each vehicle to make the trip?

c. How do you know the time it took each vehicle to complete the trip?

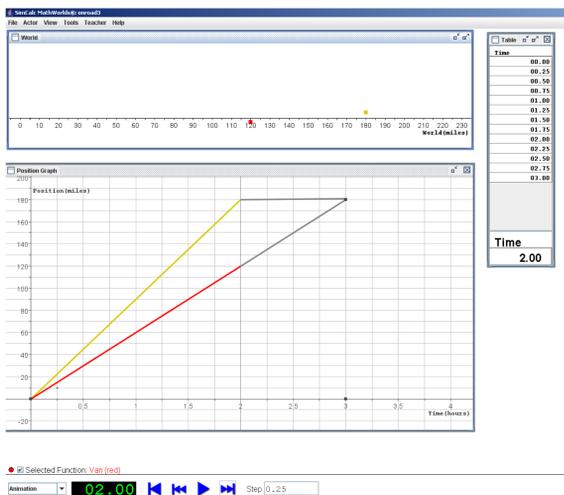
d. Run the simulation in the file *ovroad2.2mw*. Were your predictions right? Explain any differences.

e. Tell a story that could go along with the graph of the trip of two years ago. Make sure to include what speeds the bus and the van traveled. Also, explain how you determined the bus' and van's speeds.

### Simulation @ 1.5 hours into the trip<sup>3</sup>



### Simulation @ 2 hours into the trip



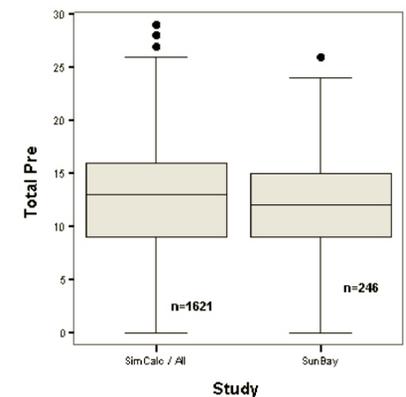
## Findings

The SunBay pilot study asked teachers to implement a curriculum unit that integrates dynamic technology. The unit had been field tested in Texas (Roschelle et al., 2010). All professional development (PD) offered to support implementation was based on an "inquiry stance on teaching" (Cochran-Smith & Lytle, 2001, p. 47). The summer workshops were adapted from a designed PD experience intended to immerse teachers in the unit's mathematical and technical demands (Roschelle, et al. 2009). Teachers used their laptops to solve problems, and they discussed the mathematics underlying the software's dynamic simulations. Teachers acted as learners and used digital technology to enact the curriculum's core strategy (Predict, Check, and Explain) and deepen their knowledge of the unit's underlying mathematical concepts. They answered questions in the unit's paper workbooks. During the fall, teachers received technical assistance using the SimCalc MathWorlds® software and participated in monthly PD experiences designed to help them implement the unit and support deeper technological, pedagogical, and mathematical learning. Teachers rated the PD sessions highly, with an average rating of 4.5 on a 5 point scale across summer and fall.

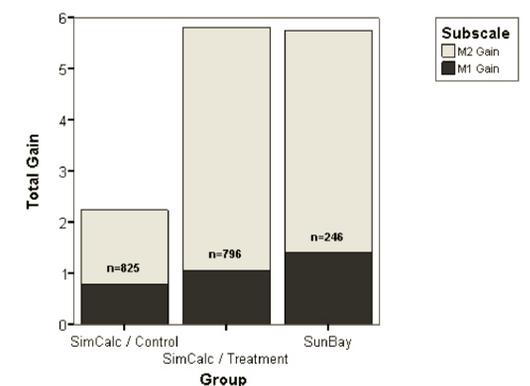
Teachers were found to implement the materials with good effect. Prior to implementation, a pre-test was administered to students; immediately after the unit was completed, a post-test was administered. The average pretest score of the SunBay students was statistically identical to the students (treatment and control) in the Texas study (Roschelle et al., 2010; SRI International & University of South Florida St. Petersburg, 2010). Gain scores to measure student learning were calculated by subtracting each student's pretest score from their posttest score. A final analysis showed the SunBay students' gain scores were also statistically identical to the SimCalc gain scores in Texas and both were significantly greater than the Texas control gain scores. There was a large and significant main effect in both studies with an effect size of 0.8 (See Figures 1 & 3). Consistent with previous studies (Vahey, Lara-Meloy, & Knudsen, 2009), there was no significant difference in mean student gain score across ethnicities including African-American, Asian, Caucasian, and Hispanic. These results indicate the curricular materials are effective regardless of student ethnicity or prior mathematics knowledge.

- (1) Co-first authors.
- (2) Workbook Samples from SimCalc Mathworlds unit: Managing the Soccer Team:©SRI International.
- (3) Simulations: ©University of Massachusetts Dartmouth

## Comparison of SunBay & Texas Pretest Scores



## Comparison of SunBay & Texas Posttest Scores



## Conclusions

The purposes of SunBay go beyond implementing software and replacement units. The collaborators intend to create a broad set of materials that allow the district's students to achieve high rates of growth in their mathematical knowledge by regularly interacting with high quality learning technologies. Whereas the presented results show the promise of this approach, they raise important questions about the nature of professional development that might support such an undertaking both in the district and in other sites.

How might computer supported collaborative learning environments be implemented broadly and fruitfully for all students' benefit? At a time when this question is still unresolved (e.g. National Mathematics Advisory Panel, 2008), it is our commitment that work on SunBay will speak to the international research community and measurably benefit the public school students of the district we serve.