

SunBay Digital Mathematics

Pilot Year 1 Final Report Brief: Learning Gains in Pinellas County, Florida

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Executive Summary

In June 2009 the Helios Education Foundation and the Pinellas Education Foundation provided funding for the pilot year of the SunBay Digital Mathematics program. The program is being run by SRI International (SRI) in collaboration with the University of South Florida St. Petersburg (USFSP) and the Pinellas County Schools (PCS).

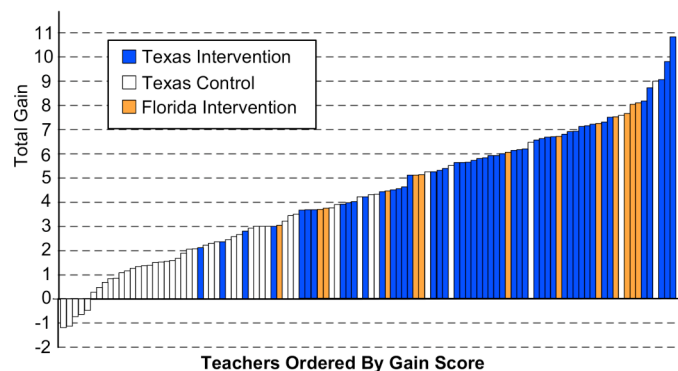
This pilot year had three specific goals:

1. Begin implementation and effectiveness studies of digital mathematics, build capacity within the collaborating organizations, and refine the teams' understanding of specific needs within PCS.
2. Develop a comprehensive strategic plan that addresses how we will deploy digital materials, provide teacher professional development, and engage school leaders.
3. Create shared intellectual capital to effectively raise additional funds.

This report details the manner in which these three goals were met. To meet Goal 1 the team recruited and trained 13 middle school mathematics teachers from Pinellas County, and each has had significant and ongoing participation in the program. The team has modified a set of technology-based algebra materials and related assessments to meet the needs of Pinellas County, and provided ongoing professional development (PD) to all 13 teachers in the effective use of these materials. Figure E-1 shows the classroom mean gain scores for all the teachers who participated in Florida, as well as all the teachers who participated in our earlier successful experiment in the state of Texas. This graph shows that students of teachers using the SunBay intervention, in both Texas and Florida, to teach the key mathematical topics of proportionality and rate showed consistently higher learning gains than students in Control classrooms who were taught by more traditional means.

In this 1-year pilot project, the SunBay team has shown the effectiveness of the Digital Math approach across a range of teachers, topics and student characteristics.

Figure E-1: The spread of mean classroom student gains shows the consistent effectiveness of the SunBay approach in both Florida and Texas



Our analysis also shows that learning gains were consistent regardless of prior math achievement and student ethnicity, providing evidence that the SunBay Digital Mathematics materials can be effective for the wide range of students and teachers found in Pinellas County. The approach was also found to be effective for a new geometry unit developed to meet the needs of PCS.

To address Goal 2 the team created a vision document that was incorporated into the January 2010 interim report. The team has since met with stakeholders from education, politics, and the business community to refine our vision, better understand how to meet the needs of PCS, and integrate our efforts into ongoing programs.

To address Goal 3, SRI and USFSP have been in continuous communication throughout the project to ensure that key leanings are being captured. The team has begun the process of requesting additional funds, and USFSP has already received funds to allow USFSP to expand its digital math offerings, while allowing our current cohort of SunBay teachers to continue to increase their effectiveness with digital mathematics materials.

1. Introduction

This report outlines the success of the SunBay Digital Mathematics Project in helping students to learn key mathematical topics that are central to the Next Generation Sunshine State Standards (NGSSS) for Mathematics. This one-year pilot project provides evidence that the Digital Mathematics approach can be successful in Florida, and can meet the needs of both teachers and students in using technology to improve student learning in core mathematics topics.

In June 2009 the Helios Education Foundation and the Pinellas Education Foundation provided funding for the pilot year of the SunBay Digital Mathematics program. The program is being run by SRI International (SRI) in collaboration with the University of South Florida St. Petersburg (USFSP) and the Pinellas County Schools (PCS). The timing is right for such a project for several reasons, including the maturity of research-based digital mathematics materials, the enthusiasm of the PCS Superintendent and other St. Petersburg community leaders for a digital mathematics approach, the plans of the USFSP College of Education to offer more digitally based mathematics offerings for inservice and preservice teachers, and the adoption of the NGSSS for Mathematics. These standards are rigorous and focused, aligned with the Common Core Math Standards, the National Council of Teachers of Mathematics' (NCTM's) recent Focal Points document, and are consistent with a digital mathematics approach.

The pilot year had three specific goals:

1. Begin implementation of digital mathematics, build capacity within the collaborating organizations, and refine the teams' understanding of specific needs within PCS.
2. Develop a comprehensive strategic plan that addresses how we will deploy digital materials, provide teacher professional development, and engage school leaders.
3. Create shared intellectual capital to effectively raise additional funds.

This final report focuses on the activities conducted between January 2010 and July 2010; the interim brief from January 2010 details the activities from the start of the program through December. This report has five main sections: (1) this introduction; (2) for reference, a summary of the first 6 months; (3) key research activities undertaken by the project team in support of Goal 1; (4) key research findings related to Goal 1, including metrics requested by the Helios Education Foundation; and (5) key activities undertaken in the areas of strategic planning and sustainability in support of Goals 2 and 3.

2. Summary of Prior Work: The First Six Months

As detailed in the interim report, during the first 6 months of the project the team made significant progress on all goals of the project. A summary of this earlier progress is outlined in this section, and subsequent sections report on activities and findings in the final 6 months of the pilot year.

Research Infrastructure

The SunBay team first established the research infrastructure necessary to execute the project. The key activities were as follows:

- Obtaining approval for research on human subjects (also called Internal Review Board, or IRB, approval).
- Recruiting schools and teachers, with the goal of selecting teachers from a representative sample of PCS.
- Preparing for data collection by selecting the classes for which we collected data (called “target classes,” these were selected to ensure that the data from the project represented the diversity of PCS) and creating an observation protocol.
- Integrating with district technologies to ensure that our digital math materials were compatible with existing school resources and providing teachers with the Digital Math materials.
- Modifying the district pacing guide to ensure that the materials were taught at an appropriate time in the school year.

Adaptation of the SimCalc Materials and Assessments

The SunBay team adapted the SimCalc materials and assessments to ensure alignment with Florida’s Next Generation Sunshine State Standards (NGSSS) for Mathematics. We found that the overall content of the materials was highly aligned with the NGSS Big Idea 1 (*Develop an understanding of and apply proportionality, including similarity*). The required revisions were primarily superficial (e.g., minor changes in formatting and terminology).

Support to Teachers

The SunBay team provided multiple forms of support to the SunBay teachers. Support included full-day professional development workshops, monthly professional development meetings, monthly online professional development assignments, and logistical support.

Co-Design of the Geometry Materials

The SunBay team engaged in a process of iterative co-design of the geometry materials, which were designed to leverage the Geometer's Sketchpad™ software program. We determined that the most appropriate focus of the materials would be to continue addressing ideas in Big Idea 1, and particularly the notion of geometric similarity, which is one aspect of Big Idea 1 not addressed in the SimCalc unit

Research Findings

The SunBay team collected student, teacher, and observation data for all teachers participating in the project. The data was used to generate initial research findings for the SimCalc implementation.

The primary finding from the first 6 months of the project was that the digital math materials were effective in PCS, replicating findings from prior work in Texas. This finding provides evidence that the project met a primary program goal, because it was the success of the program in Texas that formed the basis for the SunBay Digital Mathematics program. At the time of the interim report, we had conducted a primary analysis of the findings. In this final report, we expand those findings to a secondary analysis, which shows that the SunBay Digital Mathematics materials result in consistent learning gains across key subpopulations of students (see Results section).

Statistical analysis shows that digital math materials were effective in Pinellas County

Strategic Planning and Sustainability Activities

In the first 6 months of the project, we engaged in multiple meetings with key stakeholders, including education and business leaders in St. Petersburg, Congressional staff, and education leaders in the Federal government. These meetings led to the creation of the Big Waves Vision graphic, included in the interim report. This document has been used to create a consistent vision among all stakeholders and team members, to plan our next steps, and to explain the long-term goals of the projects to others.

The team also submitted proposals for ongoing funding, and began planning additional submissions

In the remainder of the report, we focus on activities and findings from January 2010 through July 2010.

3. Key Research Activities: The Last Six Months

Research Infrastructure

In the second half of the project a refined and expanded research infrastructure was needed. The team expanded the technology infrastructure, to include the use of Geometer's Sketchpad. This required revising the classroom observation protocol to capture key elements of the new geometry unit that would allow for future modifications to the unit. Other aspects of the research infrastructure (including the consent forms, the use of a target class, etc.) remained the same.

Classroom Observation Protocol

The classroom observation protocol was revised to meet the needs of the research team in refining the Geometer's Sketchpad (GSP) unit. Whereas the SimCalc observation protocol was designed to allow researchers to compare one key lesson across all teachers, the GSP observation was designed to provide formative feedback that could be used to refine the unit in the future. To collect this formative feedback, the team observed three teachers during *all* GSP lessons. The teachers were systematically chosen so that their students represented the diversity of students and settings within PCS.

To aid in the ongoing refinement of the unit, the observation protocol entails moment-by-moment transcription, in which all relevant dialog and actions are captured to the best of the observer's ability. Using a laptop computer in real time, the observer wrote as much literal dialogue as possible during the class session, made notes of key student and teacher actions, time-stamped key transitions in the class, and recorded what materials were being used at any given time. Once the lesson was finished, the observer immediately refined his or her observation notes, fleshing out the activities and key actions. In this way, the research team would capture a detailed recording of the class flow. The observation notes have provided valuable data that will help the team refine the GSP unit. By identifying differences in how individual teachers implemented the lessons and by noting areas in which teachers seemed to have difficulty, we are able to modify the materials with the goal of having a higher quality and more consistent set of teacher-student interactions in future classroom implementations.

Geometer's Sketchpad Materials

The SunBay team worked with teachers on the co-design of a set of GSP materials entitled "Defining Similarity." The SunBay team also began the development and piloting of a set of assessment items that ultimately will be used to evaluate the effectiveness of the unit.

Co-design of GSP materials

Initial design of the GSP materials began in October 2009. At that time, the SunBay team decided that the most appropriate use of GSP was to round out the NGSSS Big Idea 1 by creating a unit on geometric similarity. This unit had the learning goal of meeting the NGSS Math Standard that students “solve problems using similar figures.” The team reviewed existing materials, and based on an analysis of the most productive activities in meeting the instruction goals, outlined a candidate unit and began to collect teacher feedback. In the November and December monthly PD sessions, the teachers were presented with the unit outline and an initial version of a classroom lesson. The teachers engaged in using the lesson as though they were students, to understand the lesson flow. They then provided feedback on the lesson, which was incorporated into the next version.

Teacher quote:

“It was easy to understand the materials and lessons”

In the full-day January 2010 PD session, the co-designed working draft for the GSP unit was presented. Teachers again worked through the materials as students, seeing how their suggestions were incorporated into the unit. They also provided input into individual lessons, as well as the overall flow of the unit. Shortly after this PD session, the teachers received with the final unit.

Development of assessment items for piloting

The role of assessment for the geometry unit was significantly different from the role of assessment for the SimCalc unit. For our prior work in Texas, SRI had already developed and validated an assessment instrument to be used with the SimCalc unit, and the development effort was extensive in terms of both time and resources. Because the geometry unit was completed in January 2010, SRI did not already have a validated assessment designed to measure student learning along our instructional goals.

In light of these constraints, we decided to take advantage of the opportunity in this pilot project to develop and pilot assessment items as part of a rigorous assessment development and validation process that would result in a future assessment. A secondary goal of these prototype items would be to conduct an initial analysis of student learning, to provide some indication of the effectiveness of our unit.

The SRI SunBay team conducted the item generation process by collecting relevant items from released FCAT items, items used in common geometry textbooks, items used on past SRI projects, and items used in materials created by Key Curriculum Press, the developers of Geometer’s Sketchpad. These items were analyzed for alignment to our curricular goals. Our analysis showed that by making minor modifications to some of the items and significant modifications to others, we could assess most of the learning goals of the unit. A small number of our higher-order learning goals (e.g., student generation of a definition, student analysis of reasoning) required that we create new items. Through an iterative process of generating, modifying, and refining assessment items, the team generated a final set of eight pilot items that adequately represented the learning goals in

the unit. These included five constructed response items that required students to write explanations or definitions, two multiple choice items, and one calculation item.

Because most of the items required significant student writing, the expected time to administer the entire test was relatively long (30 to 45 minutes). Given the relatively short time frame of the unit itself (4 to 5 hours of instruction), the team determined that it would be a burden to expect teachers to administer the entire assessment as both a pretest and posttest. As a result, two forms of the assessment were created, each with half the items. Teachers were randomly assigned to administer Form A or Form B as the pretest, and teachers were asked administer the full test as the posttest. To further lighten the burden, we did not require the teachers to administer the posttest, although most did. While this may have introduced some bias into our secondary assessment goal (examining impact), our primary goal was satisfied in that we were able to field-test all of the items at baseline with a significant number of students.

In future work, we expect to further refine items using more rigorous validation methods. For example, we will refine the items based on student responses in the pilot, conduct cognitive think-alouds with students, and engage expert panels in a review of the items.

Providing Support to Teachers in the Use of GSP Materials

Based on feedback on the prior PD sessions and teacher interviews after completing the SimCalc unit, the team made a subtle, yet important change to the focus of the PD sessions. Whereas previously we considered all PD to be part of a single thread of PD that could occur either face-to-face (as in the full-day and monthly sessions) or online, we instead created specific goals for each form of PD. The purpose for the face-to-face was to engage teachers with the curriculum as learners (doing the math) and as teachers (planning to teach the math). The purpose for the online activities was to address teachers' technical needs through the use of existing GSP tutorials and readings. This approach helped the team focus the PD sessions and helped the teachers become more familiar with the technological aspects of the units. The overall reaction of the teachers was positive, teacher participation in the online PD increased, and we will use this model of PD as much as possible in the future.

Teacher quote:

"The PD is absolutely great. I don't think you can have any better."

Full-day professional development workshops

The working draft for the GSP unit on geometric similarity was the focus of the January 2010 PD session. This was an all-day meeting that allowed the teachers to continue to have input on the final unit that would be taught to their students in April, while working through the unit themselves in preparation for teaching it. Two SunBay researchers from SRI traveled to USFSP to help deliver the training. Eleven of the 13 teachers attended the PD.

Teachers gave the January full-day professional development workshop an average rating of 4.6 out of 5.

Monthly PD meetings

The February PD focused in topics related to the pedagogy and mathematical content necessary to teach the initial GSP lessons. Teachers and USFSP staff members discussed proportionality and similarity and created a working definition about how to measure these concepts. Participants engaged in a group discussion about creating and refining a working definition of similarity, and had extensive time to use the GSP software. Teachers also engaged in pair planning for how to teach the GSP lessons.

Teacher quote:

“The level of discussion and the development of teaching in this PD surpasses many, many others.”

The March PD focused on mathematical content in the final GSP lesson and technical questions about GSP. Teachers then were asked to visualize teaching the lesson and anticipate student responses, difficulties they may have, and so on. Teachers reported that the visualization process was very valuable in preparing to teach the lesson.

Teachers gave the monthly PD workshops related to GSP curriculum an average rating of 4.5 out of 5, and gave the PD sessions for February and March an average rating of 4.6 out of 5.

Monthly online PD assignments

To assign and support the monthly online PD assignments, the team used the PCS Moodle system. These assignments were presented in response to the teachers’ request for practice with the GSP software that did not involve the geometric similarity unit. The goal of the assignments was to provide teachers with the opportunity to develop some basic GSP skills prior to teaching the unit. The assignments prompted teachers to work on the tutorials located on the Key Curriculum Press GSP website. The assignments were well-received by the teachers (as mentioned in the teacher interviews), and teachers felt that the tutorials helped prepare them to teach the unit. Because the goals for Moodle activities were clearly defined and satisfied the teachers’ need, more teachers than in the Fall actively completed the Moodle activities.

Logistical support

The SRI and USFSP teams also supported the teachers through both face-to-face and online activities. The team uploaded materials and resources to the project’s e-Learn site, and the site was also used by teachers for occasional requests for information or clarification. In these cases a member of SRI or USFSP responded to teacher requests within 24 hours.

As previously discussed, the SunBay team also provided support for installation of the software, including having SunBay team members install the GSP software when necessary.

All teachers who used the GSP materials were visited in January by SRI and USFSP team members. All classrooms were again visited by USFSP team members who retrieved the GSP materials to send back to SRI. These visits provided opportunities for exchanging information and talking with the teachers, and sometimes students, about their experiences with the SunBay Digital Mathematics program.

USFSP and SRI team members made observations, including video and audio recordings, of the full GSP unit for three teachers. All teachers were interviewed over the telephone to debrief about teaching the unit and to share their insights about improving the SunBay Digital Mathematics program.

4. Key Research Findings

Results: Student Learning in the SimCalc Unit

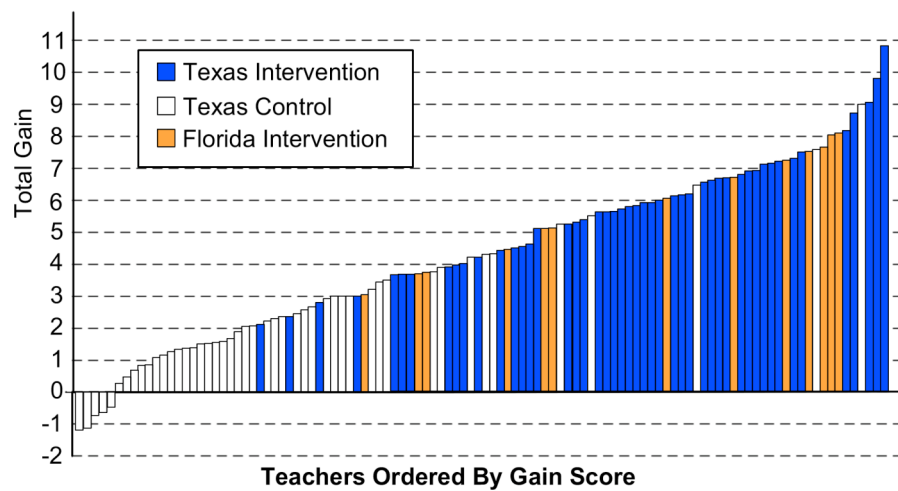
As detailed in the interim report, students in Pinellas County who used the SimCalc unit had statistically significant learning gains in the important topic of rate and proportionality. In addition, student pretest scores and learning gains for the SimCalc replicated our prior results in Texas, which showed the effectiveness of the Digital Mathematics approach. Below we present a more detailed analysis, in which we show that the learning gains found in PCS were robust across the variety of teachers who used our materials and were statistically equivalent across demographic groups.

We also report on the geometry unit, which was finalized in January 2010, and implemented in PCS classrooms in April 2010.

Learning gains across the range of teachers

Figure 1 shows the spread of mean classroom learning gains across the different teachers who used the SimCalc unit.

Figure 1: The spread of mean classroom student gains shows the consistent effectiveness of the SunBay approach in both Florida and Texas



This graph shows that teachers who did not use the Digital Mathematics materials had limited learning gains (indicated by the large number of “Texas Control” teachers grouped to the left of the graph). This graph also shows that all teachers who used the SimCalc materials had higher learning gains than half the control teachers, and all PCS teachers (labeled “Florida Intervention” in Figure 4) who used the SimCalc materials had higher learning gains than approximately two-thirds of the control teachers. This analysis provides evidence that the Digital Mathematics approach can be effective across a wide variety of teachers, including teachers in PCS.

Detailed analyses of the SimCalc unit

A primary concern of using new materials designed to teach to higher standards is that the materials could be biased against some groups of students, such as traditionally low-achieving students or students from nondominant cultures. To evaluate this possibility, we conducted two sets of analyses: one to investigate the relationship between prior math knowledge and learning gains, and one to investigate the relationship between student ethnicity and learning gains. We also conducted an analysis to determine if the learning gains using the SimCalc materials were concentrated in a small number of teachers, or if the materials were effective across the range of teachers in the program. Consistent with similar analyses in the Texas study, these analyses indicate that the SimCalc materials are effective regardless of student ethnicity or prior math knowledge, and are appropriate for the wide range of students and teachers in PCS.

The relationship between prior math knowledge and learning gains

There is a strong and statistically significant relationship between the mean classroom prior mathematics FCAT score and scores on the SimCalc pretest (see Figure 2). That is, classrooms with low FCAT scores also had low pretest scores. This finding is expected because the pretest assessment (which is identical to the posttest) and the FCAT have some overlap in the content being assessed. In addition it is worth noting that even the classrooms that score highest on the pretest had significant room for growth, as no classroom had an average score greater than 60%.

Looking next at the relationship between learning gains and prior FCAT scores, we see that prior math achievement is not a statistically significant predictor of student learning (Figure 3). This result provides strong evidence that SimCalc is effective for students from a variety of prior math backgrounds.

Figure 2. Classroom FCAT levels and pretest scores are highly correlated.

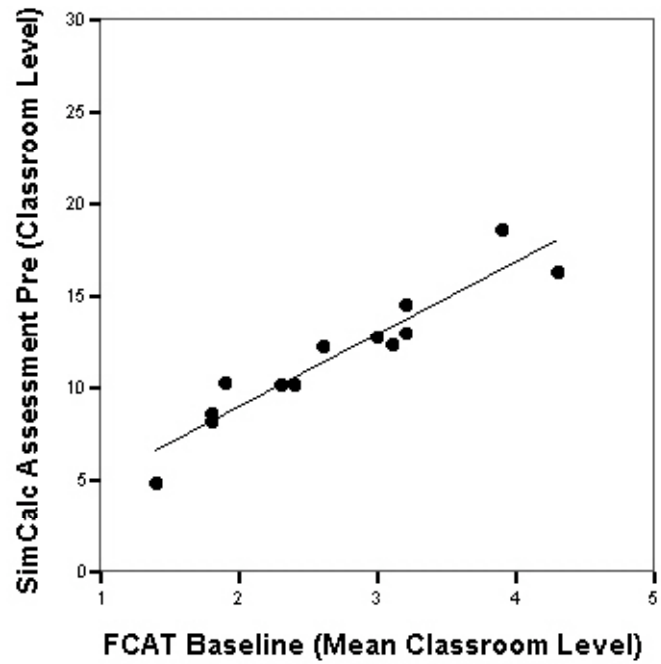
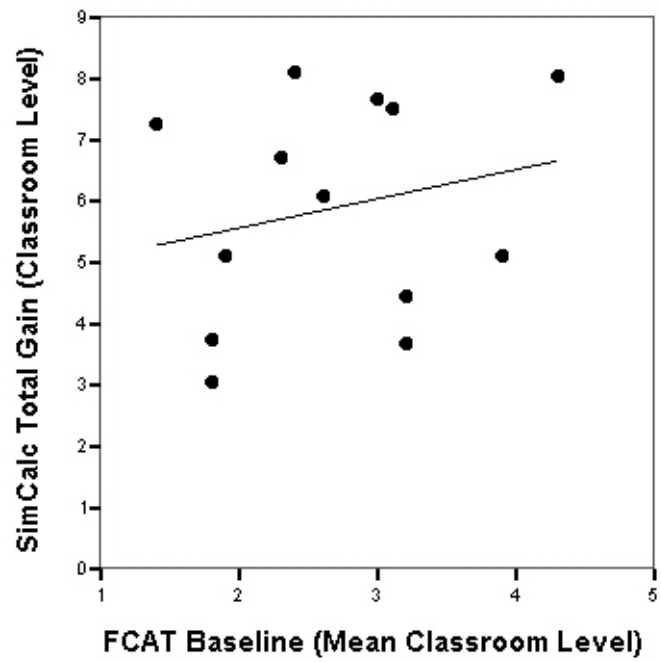


Figure 3. Classroom FCAT levels and gain scores are not statistically significantly correlated.



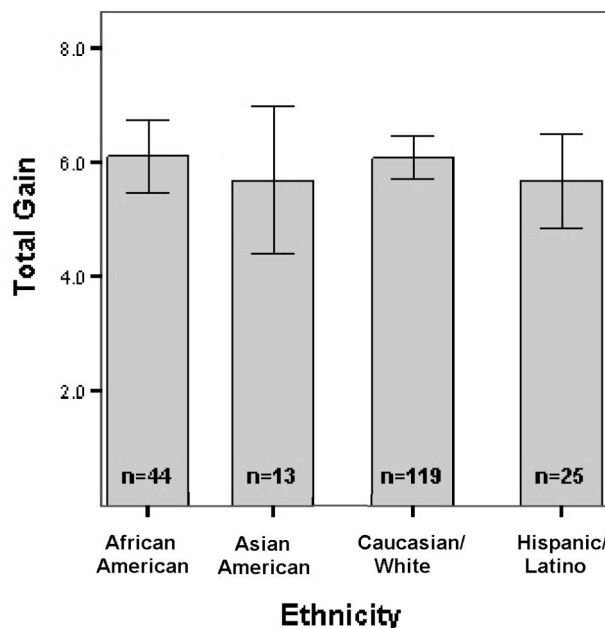
The SunBay materials were successful for a wide range of students, including those with low prior achievement scores in mathematics.

We note that for all prior classroom-level FCAT baseline means there is wide variation in learning at the student level. This finding is also consistent with prior SimCalc studies. As our research moves forward, one focus will be to identify those teaching practices that are most effective and disseminate them more widely among teachers. We expect that, through these efforts, we will be able to reduce teacher variability and show similarly strong learning gains for all students.

The relationship between student ethnicity and learning gains

Consistent with achievement data nationwide, the SunBay data shows that the mean African American student pretest score is significantly lower than the mean Caucasian student pretest score (while the mean for Hispanic students was also lower than Caucasian this was not found to be statistically significant; this difference may be significant in a larger sample, but our sample of PCS students had relatively few Hispanic students). However, there was no significant difference in mean student gain score across ethnicities (see Figure 4). This finding is again consistent with prior SimCalc studies which found that the materials are effective across diverse groups of students.

Figure 4. Student learning was similar across ethnicities. The error bars, which overlap across all groups, show that mean total gain was statistically the same across groups.



While there were significant pretest differences based on student ethnicities, learning gains using the SunBay materials were the same across ethnicities.

Classroom Implementation and Learning with the GSP-based Unit

Teacher quote:

“I think it worked really well. There is not enough of this kind of stuff. Overall, [SunBay Digital Mathematics] reinforces the whole idea of higher order thinking.”

Teachers were enthusiastic about implementing the GSP unit and found it to have an appropriate mix of technology and nontechnology activities.

While the use of computers was not uniform among all teachers using the GSP materials, the use of computers was more consistent than we found with the SimCalc unit. With the SimCalc unit, we found that many teachers used the computers intermittently and did not use computers on all days for which computers were recommended. In contrast, teachers implementing the GSP unit tended to use computers when recommended. The difference in use is likely to be due to a combination of factors. By the time the GSP unit was taught, teachers had more familiarity with having students use computers in the classrooms, there was better technology support in the schools, and there was proactive involvement of the SunBay team to ensure that the software was accessible and downloaded before the unit began. In addition, the GSP unit took a substantially shorter length of time. Whereas the SimCalc unit was designed to be implemented across approximately 3 to 4 weeks (15 to 20 hours of instruction), the GSP unit was designed to be implemented in 1 week (4 to 5 hours of instruction). The reduced time span may have resulted in teachers being more willing and able to use the computers whenever recommended.

Teachers also exhibited different teaching styles when using the GSP unit, but again there appeared to be less variability in the GSP unit than in the SimCalc unit. The sequence of developing the definition of similarity using the approach of predict-check-explain was followed by most teachers. This model was established in the fall SimCalc unit, so it was familiar to teachers and students. The teachers relied on the written materials and largely taught the lessons as provided and modeled during the PDs. The three teachers observed clearly used the annotations provided in the teachers' GSP workbooks during instruction. This use was a change from the SimCalc experience, when it seemed many teachers did not take full advantage of the teacher guide.

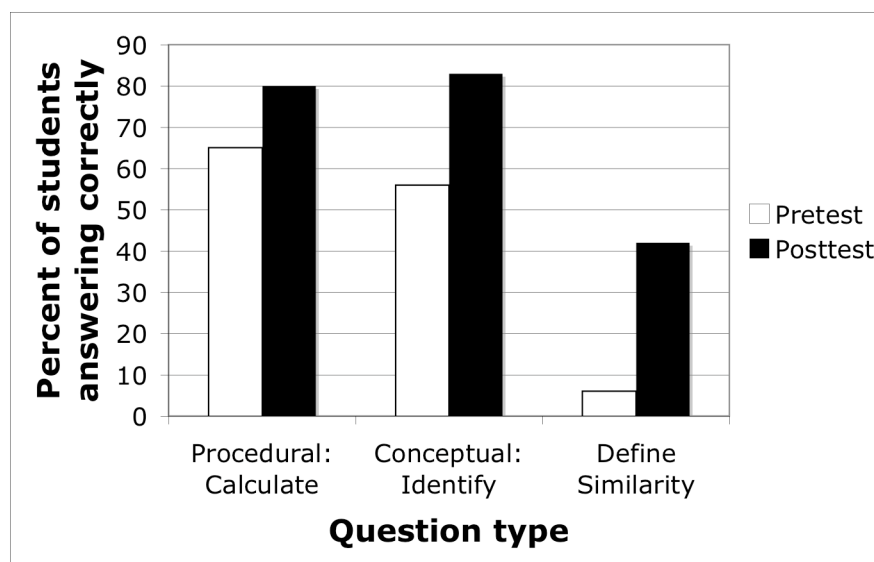
Analysis of the Piloted assessment items: evidence of student learning

As discussed previously, the primary goal of the assessment design effort was the piloting of items designed to be aligned with the geometry unit, and a secondary goal was to provide some indication of the effectiveness of the unit.

For our primary goal, our analysis showed that, while few items currently have strong enough technical qualities to be used on a wide scale, many of the items have promise for assessing new, higher standards with further refinement. For example, while some of our constructed response items (in which students are expected to provide explanations or definitions) were problematic for many students, these data provide us with a corpus of student responses that will allow us to develop distractors for multiple-choice items.

For our secondary goal, we selected three items that were aligned with the core learning goals of the unit and had reasonable technical qualities (i.e., the percent correct on the pretest indicated they were neither too easy nor too difficult). Student performance from pretest to posttest on these three items provide preliminary evidence that students using the SunBay GSP unit made substantial learning gains on key mathematical procedures as well as on important concepts (see Figure 5). On the first item, as an example of learning a procedure, students were asked to calculate one side of a rectangle given corresponding sides of a proportional rectangle. Before the start of the unit approximately 65% of students were able to apply a procedure to arrive at the correct answer, compared to 80% at the end of the unit. Student gains were even more impressive on the second item, a more conceptual question that required students to reason proportionally: given one rectangle, they had to identify another proportional rectangle. Before the start of the unit, approximately 56% of students were able to successfully do this, compared to 83% at the end of the unit. The third item demonstrates that students also were better able to generate definitions. Before the start of the unit approximately 6% of students were able to generate the definition of similar rectangles, compared to 42% at the end of the unit.

Figure 5. Student pretest and posttest percent correct on three items



Teacher quote:

“Some of my students who, according to FCAT were lower level, really began to shine...[they were doing] more thinking and using their natural ability.”

These results must be interpreted with caution. As described above, examining indicators of impact was only a secondary goal in our assessment development and implementation, as priority was given to providing substantial field test data in the pretest. Of particular note was that teachers were free to choose whether or not to administer the posttest. While most teachers did, this self-selection may have introduced bias. Also, we did not have a large enough sample of students to examine differential learning across student groups.

Nonetheless, teachers perceived the GSP unit to be robust across a wide variety of students, and we expect future studies to show similar robustness across prior achievement and student ethnicity.

Teacher interviews: preparation for teaching

The teachers were extremely positive about their SunBay experience. They expressed a strong desire for an ongoing professional community of collaborators focused on content knowledge and pedagogy. The SunBay Digital Mathematics approach to professional development enabled the teachers to continue to talk and think about how to present math content to their students. The teachers saw and valued the predict-check-explain cycle used throughout the SunBay materials and understood how the technology facilitated that approach. Teachers stated that, although they had been expected to integrate technology into curriculum in the past, they had never had a coherent curriculum like the SunBay units that provided the scaffolding for software applications. The teachers spoke of better student comprehension and higher student engagement across all groups of students.

Summary of results

The data from the SimCalc unit and from the GSP unit indicates that the SunBay's Digital Mathematics approach can be used across multiple math topics to increase students' procedural knowledge and conceptual understanding. Conceptual understanding is key to new higher standards such as the NGSS and the Common Core Standards Math Standards, and also is key to preparing students for advanced math including algebra and calculus. Additionally, SimCalc learning gains have been found to be robust and consistent across prior math achievement and student ethnicity.

5. Strategic Planning and Sustainability

In addition to the classroom materials work, the SunBay team also engaged in the development of a strategic plan that will set the course for a 5 to 10 year SunBay Digital Mathematics implementation. The foundation of the strategic plan is the SunBay Big Waves Vision document that was included in the interim report. Over the last half of the project, we engaged in four related strands of activities that inform the strategic plan and will lead to sustainability: interactions with key stakeholders, public outreach, integration with ongoing programs, and proposals for ongoing funding. Not all activities reported on in this section were funded as part of this pilot SunBay Digital Mathematics program; SRI, USFSP, and PCS each contributed significant funding and labor for some of these activities. However, because these activities all have the goal of a long-term sustainable program, we include them here.

Interactions with Key Stakeholders and Potential Funders

Throughout the course of the project, there were ongoing meetings between SRI, USFSP, and key PCS personnel. Of particular importance were meetings with PCS district Superintendent Julie Janssen and Rose Mack, Secondary Mathematics Supervisor. These meetings served to further refine the SunBay vision and discuss approaches to integrating the SunBay Digital Mathematics program with other initiatives in PCS (in particular, those of the Lastinger Center).

As part of the team's internally funded effort in writing and submitting a \$15.6M proposal to the Department of Education's Investing in Innovation (i³) Fund (discussed in the Ongoing Funding section), SRI sent a team consisting of SRI Policy Division Vice President Dennis Beatrice, CTL Co-Director Jeremy Roschelle, Project Lead Phil Vahey, and Proposal Coordinator Gucci Estrella to St. Petersburg to meet with key PCS and community stakeholders in April 2010. During the course of the 4-day visit, Phil Vahey, Jeremy Roschelle, Vivian Fueyo, and Helen Levine met with Peter Betzer (President, St. Petersburg Downtown Business Alliance) and Ms. Melissa Seixas (External Relations Manager, Progress Energy). This meeting was so successful that it was followed by a meeting with Vinny Dolan, President, Progress Energy. Mr. Dolan was enthusiastic about the direction of the SunBay Digital Mathematics program, and in addition to Progress Energy's commitment to funding the first cohort of teachers in the Certificate program, we are actively seeking other ways to engage with Progress Energy in the future.

The SunBay team met with stakeholders from PCS, the business community, the state department of education, and the Federal government

During the April trip, Phil Vahey and Vivian Fueyo made a presentation to the St. Petersburg Downtown Business Alliance about the program status. The attendees were enthusiastic about the program, and expressed their support for the SunBay Digital

Mathematics program as a core component of PCS mathematics education. Meetings such as this are part of our effort to build understanding and trust among the community. The trip and preparation for the proposal also provided an occasion for the SRI and USFSP team to interact with additional key PCS personnel, including district grants specialists and the Director of the Evaluation Research and Accountability department. These relationships will provide a foundation for smooth interactions between SRI, USFSP, and PCS moving forward.

Following up on meetings with Congressional representatives reported on in the interim report, Dean Fueyo and Dr. Roy attended a luncheon meeting with U.S. Representative Bill Young and had an opportunity to explain the project to the Congressman as well as to key members of his staff. Staff members from U.S. Representative Kathy Castor's office were hosted by Dean Fueyo and Dr. Roy during a visit to a SunBay classroom where they observed a portion of a math lesson using Geometer's Sketchpad. As a result of these meetings, both Congressman Young and Congresswoman Castor's staff explicitly expressed support for future funding requests.

In June and July 2010, both SRI and USFSP took additional steps toward securing long-term funding for the project. Curt Carlson, CEO of SRI International, worked with the SRI team to create a refined summary of the project that would be appropriate for CEOs and other high-level executives. USFSP hired Rick Baker, former Mayor of St. Petersburg, to further explore possible funding opportunities for the SunBay Digital Mathematics program. Curt Carlson and Rick Baker met with former Governor Jeb Bush to inquire about potential funding opportunities. Governor Bush was impressed with the results of the project and assisted in identifying other influential leaders who would be helpful in the long-term success of the project. Based on a suggestion from Mr. Bush, Mr. Baker also had conversations with key executives including John Winn, former FL Secretary of Education, and a briefing of the project is currently being scheduled.

Steps were also taken to introduce the SunBay project to officials within the state of Florida. PCS district Superintendent Julie Janssen has briefed Eric Smith, the Florida Commissioner of Education, who has expressed support for the project. SRI International has been in discussions with the Tampa Bay Area Legislative Delegation, which consists of state legislators from Hillsborough, Pinellas, Pasco, Manatee, and Sarasota counties. The delegation plans to visit the St. Petersburg branch of SRI in late August or early September, at which time they will be briefed on the SunBay Digital Mathematics project.

Public Outreach

As a way to publicly acknowledge the success of the SunBay Digital Mathematics program, and especially the efforts put forth by the teachers in the project, the Pinellas Education Foundation hosted an event celebrating the end of the first year of the project, held at the Gus A. Stavros Center. The Celebration was attended by Chancellor Margaret Sullivan and Vice Chancellor for Academic Affairs Norine Noonan of USFSP; Mr. Ian

Smith of the Helios Foundation; Superintendent Julie Janssen and senior PCS administrators including Mr. James Madden, Jr., Deputy Superintendent, Curriculum and Operations; Ms. Kathy Fleeger, Deputy Superintendent, Chief Academic Officer; Ms. Barbara Thornton, Associate Superintendent of Secondary Schools; Ms. Stephanie Joyner, Director of Middle School Education; Ms. Rose Mack, Secondary Mathematics Supervisor; and the USFSP SunBay team. All SunBay teachers who participated in the GSP unit were present.

The SunBay Digital Mathematics program has also been featured in two videos that have been made available to the public. The first is part of the Helios annual report, available at <http://www.helios.org/annualreport/>. The second is a video created by PCS, played at a

PCS school board meeting and available at <http://pinellasschool.igmp2.com/citizens/VideoMain.aspx?MeetingID=1074&AgendaID=1071&FileFormat=pdf&Format=Agenda&MediaFileFormat=wmv>. The summary of the SunBay Digital Mathematics program is found at 6 minutes and 30 seconds into the video.

News articles about the project include the following:

- SRI International News Release, August 10, 2009: Middle School Mathematics Education Pilot Project Launched in Pinellas County, Florida. Available at <http://www.sri.com/news/releases/sunbaymath.html>.
- MarketWire, August 10, 2009: *Middle School Mathematics Education Pilot Project Launched in Pinellas County, Florida*. Available at <http://www.marketwire.com/press-release/Middle-School-Mathematics-Education-Pilot-Project-Launched-Pinellas-County-Florida-1028334.htm>.
- Tampa Bay Business Journal, August 10, 2009: Pilot math project involves SRI, USF and Helios Education Foundation. Available at <http://tampabay.bizjournals.com/tampabay/stories/2009/08/10/daily26.html>.
- St. Petersburg Times, August 11, 2009: A collaboration hopes to help seventh-graders in Pinellas County master Algebra I. Available at <http://www.tampabay.com/news/education/k12/article1026561.ece>.
- University of South Florida St. Petersburg News Release, August 12, 2010: COE and SRI Collaborate to Improve Middle School Math. Available at: <http://www.usfsp.org/inews/view.asp?ID=557>
- St. Petersburg Downtown Partnership, August 20, 2009: Mathematics Education Pilot Project Launched. Available at: <http://www.stpetpartnership.org/news/29408/>
- WRCB TV website, December 18, 2009: *SRI International and State and Regional Leaders Convene for Ribbon Cutting at New SRI Facility in St. Petersburg, Florida*. Available at <http://www.wrcbtv.com/Global/story.asp?S=11698866>.

- University of South Florida St. Petersburg News Release, December 28, 2010: Progress Energy Foundation Gift Funds Math Education Project. Available at: <http://www.usfsp.org/inews/view.asp?ID=594>
- Tampa Bay Business Journal, July 16, 2010: Teacher education wins NCATE stamp of approval. Available at <http://tampabay.bizjournals.com/tampabay/stories/2010/07/19/focus1.html>.

The project has also created websites designed to provide information about the project to the public. The sites are as follows:

- The SunBay Digital Mathematics program website, available at <http://sunbay.sri.com/>.
- SRI's SunBay Digital Mathematics program page, available at <http://ctl.sri.com/projects/displayProject.jsp?Nick=SunBay>.
- SRI's story kit, available at <http://www.sri.com/news/storykits/sunbay.html>

Integration with Ongoing Programs

The SunBay team has identified integration with ongoing programs as key to long-term sustainability. We have begun this integration within USFSP and PCS, and have engaged in conversations designed to vastly expand the scope of the SunBay Digital Mathematics program. Conversations have taken place with two major PD delivery organizations within Florida, the Lastinger Center and the University of Central Florida.

USFSP Certificate in Digitally Enhanced Mathematics Education

In response to Superintendent Julie Janssen's November 2009 statement that Pinellas County does not need more math teachers at this time but instead needs better math teachers, USFSP is delivering a graduate-level certificate program to offer advanced pedagogy training in digital mathematics for middle grades math teachers. The certificate program in Middle Grades Digitally Enhanced Mathematics Education (MG DEME), will provide the foundation prepare teachers to lead the SunBay Digital Mathematics efforts in their own schools. The certificate comprises five courses, three in mathematics and two in pedagogy. The three mathematics courses form the foundation of higher mathematics in grades 7 through 12 and beyond: (1) algebraic thinking, (2) geometry and measurement, and (3) the processes of mathematics and data analysis. These courses will integrate software such as SimCalc, Geometer's Sketchpad, and Tinkerplots with activities that exemplify the digital mathematics approach. Other courses are designed to provide middle school mathematics teachers with technological pedagogical content knowledge based on digital enhancements that include graphing calculators and presentation software to deepen the mathematical learning of their students.

The 15-credit hour certificate is predicted to be a popular one with middle school math teachers in Pinellas County as it will allow them to teach the SunBay Digital Math materials, and also move them up the salary scale. For any teacher seeking to pursue a master's degree program, four of the five courses from the certificate program are transferable. At this time, there are 11 teachers in the first cohort of the program; for these 11 teachers the first of the five courses was funded by a grant from Progress Energy. The second course will be funded by PCS.

Scaling up the use of SunBay materials in PCS

This August, the SunBay team will offer SunBay Digital Mathematics training as part of PCS's standard PD offerings for middle school math teachers. The PD will be offered to teachers in schools that are already part of the SunBay effort. These include schools in which the SunBay materials have already been implemented, as well as schools that have multiple teachers participating in the Certificate program.

Expanding the scope of SunBay across Florida

The SunBay team, at the urging of Julie Janssen, has engaged in a series of ongoing conversations with Don Pemberton of the Lastinger Center. The team has identified complementary strengths of the Lastinger Center and the existing SunBay partners, and is currently engaged in a process of mutual exploration designed to identify specific actions that could be taken by the SunBay team and the Lastinger Center to build upon these complementary strengths.