Teacher Perceptions and the Impact on their Practice of a Four-pronged Professional Development Model

Karina K. R. Hensberry[1] & George J. Roy[2]

[1]University of South Florida St. Petersburg, khensberry@mail.usf.edu; [2]University of South Carolina, ROYGJ@mailbox.sc.edu

Study Background

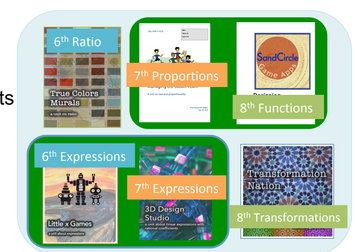
Supporting teachers to improve their instruction requires quality materials and professional development. The SunBay Digital Math Project provides a 3-part approach to inquiry-based mathematics (see figure below).

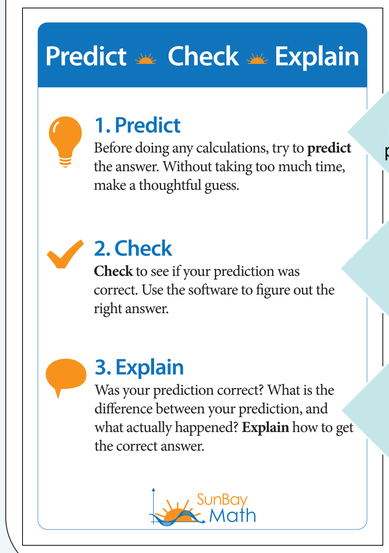
Rich Curriculum	Professional Development	Interactive Technology
• Aligned with RME principles Our focus	• Active and pedagogy-rich • Grades 6-8 math teachers	• Dynamically-linked multiple representations • Concept-focused

Professional Development. Our framework emphasized teacher's own mathematical content development; attention to how students interacted with the curriculum; teacher beliefs that middle school students can learn deep, rich mathematical concepts; and building a network of teachers who can support each other and attend to their collective learning throughout implementation (Doerr et al., 2010).

Focus on Curriculum, Pedagogy, and Technology

6 Modules across 4 Apps.
The technology engaged students in solving realistic problems.





Students rely on their intuitions and beginning level understanding to make a prediction about a mathematical situation.

The technology is a means for testing predictions and understanding what was right or wrong about them.

Students should focus on *why* predictions did or didn't align with the Check, and build conceptual resources.
Students build skill at explaining.

PCE Cycle. Encourages students to engage in sense-making and articulate their thinking.

Research Questions

We wanted to explore how to support teachers to adopt curricula, tools, and practices that align with RME principles. We examined the following RQs:

1. What are teacher perceptions of this professional development model?
2. In what ways has this professional development model impacted teacher practice?

Methods

Participants. This study was conducted in a diverse middle-sized district in the Southeastern US. During the three-year study, 40 teachers were trained and implemented SunBay units.

Data Sources and Analyses. Data collected included: audio-recorded interviews with teachers, field notes from classroom observations, teacher surveys, audio transcripts and field notes from end-of-year teacher debrief sessions, and notes from team meetings. As data were collected, we engaged in open coding (Hatch, 2002) to determine themes. We cross-checked data for inconsistencies and revised when necessary. We also shared with teachers what themes we noticed and made modifications based on their input.

The Professional Development

Our goals were to support teachers to implement SunBay units with fidelity and to affect student achievement. To this end, we developed a three-year professional development model based off of CBMS (2012) principles:

High-touch

•Our PD was iterative, not single-session; so teachers had opportunities to reflect, implement, and troubleshoot issues that arose (e.g., DeMonte, 2013). We provided multiple-day PD for new and returning teachers prior to the implementation of each SunBay unit. Teachers attended at least two sessions, and received individual correspondence from PD facilitators and feedback from classroom coaching observations (Blank & de las Alas, 2009).

Responsive

•Session topics varied depending on stakeholder needs, focusing on learning the content and curriculum over two days. They learned to **"do the math"** like their students. Teachers also received PD on issues identified by teachers and the authors during interviews, observations, surveys, and PD discussions. Sessions focused on Productive Struggle, Student Talk (year 2), and the eight Effective Teaching Practices (year 3; NCTM, 2014).

Collaborative

•In planning, the PD developers worked closely with curriculum developers and district personnel. This ensured we fulfilled the vision of the developers and met district needs.

Research-based

•In addition to the SunBay materials being research-based (Vahey et al., 2013), we drew on research about best practices for teaching mathematics as we made decisions about the best way to deliver PD (e.g., NCTM, 2014; Stein & Smith, 2011). We chose to actively engage our teacher-learners with the content, asking them to explain their thinking and justify solutions.

References

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Results

Teachers believed in the SunBay technology, materials, and pedagogical approach. In particular, they mentioned the use of technology itself, the real-world applications, and the visual nature of the way concepts were displayed as some of the greatest rewards about SunBay. They also noted that students took ownership of their own learning and "were encouraged to challenge themselves to think through problems."

Teachers found the PD model to be relevant, useful, responsive, and impactful. They commented that "this is the best PD we have ever had," and "it's not like other PD where you don't want to go … I wanted to come to this PD." They found the facilitators supportive and responsive, and felt well-prepared to teach each of the units. Some teachers also reported that they used strategies learned at SunBay PD (e.g., asking students to make predictions before solving) when teaching other non-SunBay units.

The PD was effective for the teachers. Teachers reported that during SunBay units, their students were more participatory, more actively engaged with content, seemed to enjoy themselves more, and better understood the mathematics. Their students "were eager to understand the concepts behind the math."

Relationships built with PD team were critical. The PD facilitators and district personnel involved with SunBay worked hard to build rapport and demonstrate care for participating teachers, and the teachers noticed. They felt that facilitators "were always available and listened to us as they planned PD" and "that if I need anything, it's a phone call away".

The curriculum and pedagogy were challenging. For most of these teachers, the SunBay approach was a shift in how they were used to teaching. It was challenging to think on their feet, to manage classroom discussions well, and to not *tell* students but allow them time to work things out on their own. They also struggled greatly with time management and pacing. Curriculum developers responded to this feedback by shortening units and providing better-suited materials for students, for which the teachers were grateful and reported their timing issues were "much better".

Opportunities for empowerment result in empowered teachers. Though participation was technically voluntary, many Year 1 teachers expressed being "volun-told" to participate. Over time, however, this perspective shifted, with participants becoming SunBay advocates and using the SunBay lessons for their formal school-based observations and evaluations. Two teachers presented at their state-level Council for Teachers of Mathematics conference, and four volunteered to serve as Teacher Leaders and carry on SunBay trainings with others in the district once grant funding ran out.

Conclusions

When adopting new curricula and encouraging teachers to change their thinking and modify their instruction, professional development has the potential to make a great impact on teacher practices and student achievement, but many times fails to do so; we offer an alternative. The PD model we implemented and relationships we built with teachers resulted in relevant, impactful, and empowering PD for teachers. This high-touch, responsive, collaborative, and research-based approach may serve as a model for providing PD to teachers adopting a curriculum and pedagogical approach aligned with RME design principles.

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