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, rigorous mathematical concepts; and building a network of teachers who can support each other and attend to their collective learning throughout implementation (Docter et al., 2010).

Focus on Curriculum, Pedagogy, and Technology

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

Our focus

Rich Curriculum

• Aligned with RME principles

Professional Development

• Active and pedagogy-rich
• Grades 6-8 math teachers

Interactive Technology

• Dynamically-linked multiple representations
• Concept-focused

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

Students rely on their intuitions and beginning understandings, make a prediction about a mathematical situation.

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

1. Predict
   Before doing any calculations, try to predict the answer. Without taking too much time, make a thoughtful guess.

2. Check
   Check to see if your prediction was correct. Use the software to figure out the right answer.

3. Explain
   Why was your prediction correct? What is the difference between your prediction, and what actually happened? Explain how to go to a correct answer.

Predict • Check • Explain

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

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 CDMS (2012) principles:

High-touch

• Our PD was iterative, not single-session; so teachers had opportunities to reflect, implement, and troubleshooting 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 feedback 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 Promoting Student Strategies, Teacher Talk (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 (Valhey 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, 2011). We chose to actively engage our teacher-learners with the content, asking them to think and justify solutions.

References


Data collected included: audio-recorded interviews with teachers, field notes from classroom observations, teacher surveys, audio transcriptions 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.

The 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

Participants. This study was conducted in a medium-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 transcriptions 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.

The 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.

Methods

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?

Recalling the research literature, we used qualitative methods to explore teacher’s experiences with SunBay units. The data for this analysis were collected in the form of semi-structured interviews with teachers and in-person (face-to-face) and telephone surveys. The qualitative data were coded to identify common themes. Finally, we synthesized these data and explored the professional development experiences of teachers as they implemented SunBay units. The data were then analyzed and organized into categories. These categories were then reanalyzed and further refined to develop a deeper understanding of the professional development experiences of the teachers.

Research Questions

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 expressed 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.

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 easier 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 needed 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 teachers felt they were being “voluntold” to participate. Over time, however, this perspective shifted, with participants becoming SunBay advocates and using the SunBay lessons for their formal school-based research 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 significant impact on teacher achievement and students. Many times, however, professional development has the potential to make a great impact on teacher achievement and student achievement, but many times fail 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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