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## Research to Practice Article

### *Choosing Your Next Professional Development: Lessons from an Urban STEM Initiative*

Based on the published SSM Journal Research Manuscript:

*An Integrated Elementary STEM Initiative in a Large Urban School District: Implications for Practice*

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The study that this paper discusses examines the professional development (PD) of an integrated K-5 Science, Technology, Engineering, and Mathematics (STEM) curriculum in a large urban school district. The district serves approximately 85,000 students (85% African American, 8% White, 5% Hispanic/Latino, 1.0% Asian; 84% eligible for free- or reduced-price meals). In 2010, the district decided to implement an integrated STEM curriculum in low-performing elementary schools. Through collaboration with science education and engineering faculty from a local university, five STEM units were developed for each of grades K to 5. Twenty-two schools elected to adopt the new curriculum.

To teach the content and pedagogy needed to implement these new units during the upcoming school year, the district provided two weeks of professional development, followed by four weeks of teaching in summer school. The professional development was taught by a master STEM teacher from the district and consisted of participants working in similar-grade groups to learn and do the units they would be teaching in the summer and coming school year. Six teachers from each school participated in the professional development. The four weeks of the summer school program provided 60 hours of instructional time for teachers to implement the new

curriculum. An instructional coach was assigned to each school to support teachers as they taught the new curriculum.

#### **Research Questions**

The study described here was interested in answering the following questions: (a) How did the teachers describe their experiences with the two-week professional development that prepared them to teach in the four-week STEM summer school curriculum?; (b) What aspects of the professional development and subsequent summer school program supported the teachers in the enactment of the STEM curriculum during summer school?; (c) What aspects of the professional development and subsequent summer school program created barriers for the teachers as they enacted the STEM curriculum during summer school?; and (d) What were some of the supports and barriers to the enactment of the STEM curriculum during the academic year?

#### **Findings**

Researchers analyzed teacher interviews and correspondence using Desimone's (2009) Critical Features of Professional Development as a framework for teachers' descriptions of their experiences. These features, Desimone argues, represent a consensus of research findings of what qualities lead to effective PD. They are: (a) coherence, an alignment of the PD

with policies at all levels in the school system; (b) content focus, an explicit linking of content to the classroom (c) active learning, which includes observing a master teacher or being observed, followed by reflection; (d) collective participation, where participants are grouped with other teachers from the same grade level, subject, department, school, etc.; and (e) duration, that PD is long enough to support intellectual and pedagogical change.

Within the context of Desimone's PD framework, the work of Anderson (1996) provided a framework to classify potential barriers to implementation and identify the ways in which the PD addressed those barriers. As summarized by Johnson (2006), Anderson identified three dimensions of the barriers teachers encounter when implementing educational reform: (1) technical barriers—teacher content knowledge, pedagogical knowledge, and a teacher's ability to teach constructively and implement reform; (2) political barriers—lack of school or district level support, including not having appropriate materials; and (3) cultural barriers—teacher beliefs about students and learning.

Analysis revealed that the aspects of the PD that supported teachers in implementing the STEM curriculum correspond to Desimone's Critical Features, as described above. For example, teachers appreciated the coherence of the new curriculum in that it matched the coming changes in the state and district policy. While many teachers in this study expressed concern over teaching STEM, as they had traditionally taught this content as separate subjects (a technical barrier to reform), the content-based nature of the PD—teachers worked through the same lessons they would teach their students—left teachers feeling prepared for implementation of the curriculum. Teachers engaged in active learning (being observed, observing other teachers, engaging in interactive discussions, reviewing student work, and doing the activities before teaching students) during the six weeks, which teachers cited as preparing them to implement the curriculum with their students. Working in grade-level groups, a form of collective participation was a strength because teachers were

able to learn from each other to refine their instructional practices. The critical features were a useful framework to understand the strengths of the PD.

Woven throughout teachers' interviews was the importance of the instructional coach. The instructional coaches supported teachers' development and guided them towards goals of the district, improving the coherence of the PD. Teachers indicated that coaches were prepared to transfer content and pedagogical knowledge. Coaches helped develop teachers' confidence in teaching inquiry-based lessons through encouragement, modeling STEM lessons, co-teaching, assisting with instructional materials management, facilitating weekly professional learning community meetings, and helping teachers to reflect on their practice. In all, the coaches functioned to enhance the coherence, active learning, content focus, and collective participation inherent in the PD, further reducing the barriers to implementing reform.

As with any new program there were some challenges identified as well. Some teachers received mixed messages from the PD providers, an indication of a lack of coherence. In some cases, the participants found their instructional coach unapproachable, resulting in a loss of the positive role the coach played for many other teachers. Other teachers expressed that they did not have enough time to implement the entire curriculum in the summer school sessions. If we consider the implementation in the summer school program a form of PD, this is a reminder that the right duration for PD will be different for everyone. Finally, some teachers indicated that they did not have the physical space to implement the hands-on activities inherent in the STEM curriculum, which may be a political barrier (the school does not provide the space) or a cultural barrier (teacher beliefs lead them to perceive there is lack of appropriate space).

### **Implications for A Teacher's Practice**

Given that time is a precious commodity to a teacher, choosing professional development that is an effective use of your time is critical. The research described here can serve as a guide for a teacher when

selecting PD. In general, the evidence presented supports seeking PD reflective of the framework of critical features for effective PD described by Desimone.

The following are suggestions, informed by this research, to assist practitioners when selecting PD. To avoid political barriers to implementation, determine if the aims of the PD are aligned, or coherent, with those of the school, district, and/or state where the practitioners teach. If they are not aligned, then they must judge, based on their context, whether or not implementation would be feasible. It is good practice to find PD that focuses on the content practitioners intend to teach, with explicit connection to the pedagogy required. It is helpful to look for PD that does one or more of the following: model the suggested instruction; give participants the opportunity to do the same activities as their students; and/or give participants the opportunity to practice implementation. Practitioners should seek out PD that allows them to learn with teachers who teach the same grade or will be engaged in similar teaching as them. This can create a safe space for sharing and reflection. Finding PD opportunities that take place over enough time for practitioners to incorporate new elements into their practice and reflect on their pedagogy is best. This research also highlights the importance of an instructional coach in not only modeling instruction for teachers and helping them reflect on their practice, but also as assisting in reducing some of the barriers to educational reform.

Ultimately, these critical features are guides for educators to use as they plan their professional growth. Keeping these critical features in mind when

navigating PD offerings can help teachers weigh the pros and cons of a particular experience. Furthermore, this knowledge can help practitioners generate questions to ask PD providers, which will help a teacher judge the potential utility of an experience. In the end, teachers will be better equipped to make informed decisions about their own professional development experiences.

### References

- Anderson, R. D., & Colorado Univ., B. (1996). *Study of Curriculum Reform. [Volume I: Findings and Conclusions.] Studies of Education Reform* (No. 0-16-048865-6).
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: toward better conceptualizations and measures. *Educational Researcher*, 38(3), 181–199.
- Johnson, C. C. (2006). Effective professional development and change in practice: Barriers science teachers encounter and implications for reform. *School Science & Mathematics*, 106(3), 150–161.  
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### Another Resource

For more information on effective PD, see the National Staff Development Council (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009) and Cooper, J. D. (2004). Professional development: An effective research-based model. *Houghton-Mifflin Harcourt Professional Development*, 1–12.