

What Are Key Similarities and Differences in Successful Professional Development Programs?

We selected the projects described in the previous chapter based on their documented success in promoting school mathematics reform through professional development. Yet they are very diverse, not only in terms of the grade levels they address or the aspects of school mathematics reform they privilege but also in the methods and strategies they use to teach teachers.

In this chapter, we begin to examine similarities and differences among these, as well as other successful professional development projects documented in the literature. The goal of this analysis is the identification of some common principles that characterize high quality professional development, as well as some viable options within these parameters.

Characteristics of high quality professional development

Several scholars in teacher education (e.g., Clarke, 1994; Darling-Hammond, 1997, 1998; Friel & Bright, 1997; Wilson & Berne, 1999; Ball & Cohen, 1996) have recently tried to identify the characteristics of high quality professional development. Although not all characteristics proposed overlap, there is consensus that high quality professional development in support of school mathematics should contain the following elements:

- ***Be sustained and intensive.*** The changes in beliefs and practices called for by school mathematics reform require considerable time and multiple learning opportunities. The changes cannot be achieved with just a few workshops or readings. Rather, changes are likely to take several years, and teachers need to be supported appropriately throughout this undertaking.

- ***Be informed by how people learn best.*** The constructivist theories of learning that underlie school mathematics reform should be applied to structuring teachers' learning as well. Simon's (1994) model of "learning cycles" further explicates this principle. Simon suggests that teachers, just like other learners, learn in cycles by doing the following: (1) engaging actively in situations that provoke cognitive dissonance, thus initiating new constructions of meaning; (2) sharing and discussing these constructions with a group to arrive at consensus and generalizations; and (3) applying these generalizations to new situations to begin the learning cycle again at a higher level. Simon further notes that the focus of each learning cycle may be different at different points in time as teachers develop in the six following areas:

1. Knowledge *of* mathematics
2. Knowledge *about* mathematics
3. Useful and personally meaningful theories of mathematics learning
4. Knowledge of students' development of particular mathematical ideas
5. Ability to plan instruction of this nature
6. Ability to interact effectively with students (i.e., listening, questioning, monitoring and facilitating classroom discourse).
(Simon, 1994, p.72)

- ***Focus on the critical activities of teaching and learning rather than abstractions and generalities.*** In the programs described in the previous chapters, teachers participated in activities close to their own practice. For example, they examined student work, analyzed videotaped classroom interactions, engaged as learners in innovative mathematical experiences and planned instruction to try out in their own classes. Theory and research have a role in professional development, but to be meaningful, they should be grounded in the practice of teaching and learning.
- ***Foster collaboration.*** A critical outcome of professional development should be a "community of learners" in which participants sustain each other as they undertake the challenge of school mathematics reform.

- ***Offer a rich set of diverse experiences.*** To meet the many teacher learning needs we identified in Chapter 1, professional development programs need to offer a variety of experiences. It is worth noting that, despite the different choices made by the two projects described in Chapter 2, they both offered multiple professional development experiences throughout the program.

The last points suggest the value of comparing not so much entire professional development programs, but rather the many specific professional development experiences that take place within high-quality programs.

Main differences within specific professional development experiences

As we look at the specific professional development experiences within the two projects described in Chapter 2, we see first of all that they are trying to achieve different goals. The process of reform is too complex to undertake at one time. Thus, it is important that teachers be helped to focus on different aspects of that process at different times. However, to ensure appropriate support for teachers, a project should eventually take into account *all* of the needs identified in Chapter 1.

It is worth noting that goals may differ not only between projects but also among the experiences that comprise one project. For example, the overall goal of the Cognitive Guided Instruction (CGI) project was to enable elementary teachers to understand children's thinking about basic arithmetic, operations concepts. The primary goal of the Making Mathematics Reform a Reality (MMRR) project, on the other hand, could be stated as to introduce mathematics teachers to an inquiry approach to teaching. Within the MMRR project itself, however, the goals for the first and second summer institute differed. The first institute focused mostly on changes in *pedagogy* while the second institute emphasized the need for a radical change in *mathematical content* and *goals*.

Thus, we suggest making a distinction between the *content* of specific professional development experiences (such as assessment, middle school algebra, early development of operations or teaching mathematics through inquiry) and the *roles* that such experiences will play within the broader agenda of promoting school mathematics reform (such as developing a need for school mathematics reform or learning to implement an exemplary curriculum). Professional development providers or

consumers evaluating professional development experiences need to consider both.

What a program is trying to accomplish, combined with the constraints it has to deal with, influences choices about the overall *format* for the program, the kind of background and expertise needed by the professional development *providers*, and the *types of activities* teachers will engage in.

We can identify the following options for program *formats* by looking even just at the examples described in Chapter 2:

- ***Summer Institutes*** that engage teachers full time during the summer, for periods usually ranging from 1 to 3 weeks.
- ***A series of workshops*** taking place over the school year, during or after school hours.
- ***Study groups*** comprised of teachers who meet on a regular basis over the school year to work on their practice and/or discuss readings.
- ***One-to-one interactions*** between a teacher (or pair of teachers) and a mathematics teacher educator acting as consultant and/or mentor.
- ***Independent work*** done by a teacher, such as reading, planning and implementing innovative instruction, examining students' thinking or doing research.

The staff conducting professional development initiatives may also differ, even within the same project. For example, we find examples in the literature of sessions facilitated by the following personnel:

- ***Mathematics educators*** who are experts in mathematics education and mathematics teacher education. These professionals are often, but not always, affiliated with a school of education within a higher education institution.
- ***Mathematicians*** who are experts in mathematics and are usually affiliated with a mathematics department in a college or university and who conduct mathematical research or teach advanced mathematics courses.

- **Experts in related areas**, such as facilitators in leadership skills.
- **Administrators** who have responsibilities for staff development and supervision.
- **Experienced teachers** who have been implementing school mathematics reform for some time.
- Some of the **participating teachers** themselves.

Staffing professional development experiences appropriately is central to their success. The expertise that leaders need depends on the goals and content of a session. In the remaining chapters, we will examine what kind of expertise is needed and what it takes to effectively facilitate different kinds of professional development experiences.

The kind of activities that teachers engage in further distinguishes specific professional development experiences. Even just the two examples reported in Chapter 2 include a wide variety of activities: Teachers interpreted students' responses to a mathematical task, examined videotaped interviews or lessons, participated in mathematical inquiries, and conducted interviews with their students, among other things. Rather than trying to develop a comprehensive list of all possible activities, we have identified five main *types of professional development experiences* in which most professional development activities described in the literature fall:

- Mathematical experiences where teachers engage as genuine learners;
- In-depth analyses of student thinking based on their written work and or contributions to classroom discussions;
- The use of “cases,” that is, examples of practice related to school mathematics reform that are presented as videotaped excerpts or written narratives to stimulate reflection and discussion on important issues;
- Supported field experiences in which teachers attempt instructional innovation; and

- Information gathering and interpretation through both traditional activities, such as reading articles and attending presentations, and conducting research on one's own practice.

In Chapters 4 to 8, we will examine in depth each of these five types of professional development experiences. We hope this analysis will help readers evaluate the quality and appropriateness of professional development initiatives they are considering.

Note that, although both projects described in Chapter 2 ask teachers to reflect on activities and discuss them, we decided not to consider these practices as a distinct type of professional development experience. Rather, consistent with constructivist theories of learning, we consider reflection and discussion as integral to *any* professional development experience.