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In recent years, there has been growing dissatisfaction with traditional approaches to teacher education. Educators have indicated that teacher education programs are not adequately preparing teachers for future conditions and needs of students. In the early 1970s, the goal of inservice teacher education was to bring outside expertise to teachers to increase their knowledge. In the 1980s, an overly technical and simplistic view of teaching was dominant. The current focus of professional development has widened to include not only teachers but also the organizations to which the teachers belong (Loucks-Horsley, 1995). Since, the traditional ways in which professional development has been provided are now considered inadequate, this Digest will focus on recent strategies for enhancing professional learning as well as developing effective professional development models.

CHARACTERISTICS OF EFFECTIVE PROFESSIONAL DEVELOPMENT

Professional development is a critical ingredient of mathematics education reform. Effective professional development experiences are designed to help teachers build new understandings of teaching and learning through direct experiences with strategies that help students learn in new ways. Many educators and organizations have endeavored to clarify the characteristics of effective professional development in mathematics education (Clarke, 1994; Loucks-Horsley, Stile, & Hewson, 1996; Loucks-Horsley, Hewson, Love, & Stile, 1998; National Staff Development Council, 1994, 1995a, 1995b; NCTM, 1989).

Loucks-Horsley, Hewson, Love, & Stile (1998, p.36) listed the following principles that shape effective professional development experiences. Such experiences:

* Are driven by a well-defined image of effective classroom learning and teaching;

* Provide opportunities for teachers to build their knowledge and skills;

* Use or model with teachers the strategies teachers will use with their students;

* Build a learning community;

* Support teachers to serve in leadership roles;

* Provide links to other parts of the education system; and

* Are continuously assessing themselves and making improvement to ensure positive impact on teacher effectiveness, student learning, leadership, and the school community.

CRITICAL ISSUES ENHANCING PROFESSIONAL DEVELOPMENT

A decade ago, Jones et al. (1992) discussed major concerns regarding the need for professional development programs, programs that:

* Actively promote "individually guided" teacher activities;

* Generate the conditions for significant follow-through and feedback on new teaching practices;

* Provide opportunities for teacher input and involvement in establishing and developing the professional development program;

* Support an inquiry approach for addressing teachers' pedagogical problems; and generate a knowledge base for effective teacher decision- making.

Although these concerns are still critical to success, several new issues should be considered when designing professional development programs. These include: ensuring equity, building professional culture, developing leadership, building capacity for professional learning, scaling up, generating public support, supporting the effective use of standards and frameworks through professional development, finding time for

professional development, and evaluating professional development.

It is important for educators to understand that professional development cannot be prespecified in a standard format; the environment in which a program is implemented is critical. Designers need to consider contextual factors as they plan programs. Factors such as students, teachers, the physical environment, policies, resources, organizational culture, organizational structures, and the local history of professional development, along with parents and the community, must be considered when developing new programs.

STRATEGIES FOR PROFESSIONAL LEARNING

Professional development does not occur as an isolated strategy. Every program uses a variety of strategies in various combinations. According to the National Staff Development Council (Sparks & Loucks-Horsey, 1990), five different models of effective staff development for teachers were identified: training, individually-guided staff development, observation/assessment, involvement in development/improvement process, and inquiry. These can be used singularly or in combination.
Loucks-Horsley et al. (1998) discussed specific professional development strategies (learning experiences) with different purposes indicated by Brown & Smith (1997). These strategies correspond to the professional development models adopted by several different institutions or organizations. For the primary purpose of building teacher knowledge, recommended strategies are: engaging in the kinds of learning that teachers are expected to practice with their students; participating in workshops, institutes, courses, and seminars; interacting in person or through electronic means with other teachers to discuss topics of common interest; and using various kinds of technology to learn content and pedagogy.

Creating new instructional materials and strategies to meet the learning needs of students is suggested for the purpose of translating theory into practice. For the best effect when using this strategy, voluntary participation, clear expectation, an established procedure, content knowledge, and district or school administrative support are critical.

Strategies related to practice teaching include curriculum implementations (learning, using, and refining use of a particular set of instructional materials in the classroom), curriculum replacement units (implementing a unit of instruction that addresses one topic and incorporates effective teaching and learning strategies to accomplish learning goals), coaching and mentoring (working with experienced teacher to improve teaching and learning through a variety of activities, including classroom observation and feedback, troubleshooting, and co-planning), and nurturing professional developers (building the skills and knowledge needed to create learning experiences for other educators).

Lastly, action research, case discuss, examining student work (and thinking), and study

groups can be used as the strategies for the promoting reflection. To achieve desirable outcomes when using these strategies, access to research resources, time, administrative support and an atmosphere conducive to experimentation, and opportunities to share the results of their research should be provided.

SUGGESTIONS

For the 21st century, professional development of mathematics teachers must address several challenges, such as the need to educate an increasingly diverse student population, the change required by new goals for schooling, and the necessity for teachers and other educators to function well and create new organizations as needed. The paradigm shift in professional development suggests a change in emphasis from transmission of knowledge to experimental learning; from reliance on existing research findings to examining one's own teaching practice; from individual -focused to collaborative learning; and from mimicking best practice to problem-focused learning (Loucks-Horsley, 1995; Sparks, 1994).
Following are a few items that teacher educators and teachers should keep in mind to enrich professional development programs.

* Professional learning must be lifelong and relevant to student learning.

* Schools must stop counting hours or programs that a teacher participates in professional development, and start measuring what happens as result of their participation.

* Teachers should stop receiving one-shot workshops and become active decision makers in the process of designing and choosing professional development opportunities.

* Planning professional development should start with the end (outcomes) in mind and encourage teachers to be involved in the planning process.

* Professional development initiatives in mathematics should have an appropriate level of challenge and support, provide activities demonstrating new ways to teach and learn,

build internal capacity, use a team approach, provide time for reflection, evaluate the effectiveness and the impact of the activities, and use humor and have fun.

* Follow-up to professional development should be provided--such as opportunities for practice in the classroom.

* The professional development designer's challenge is to assemble a combination of learning activities that best meet the specific goals and context.

* Remember that professional development alone cannot carry a reform effort.

Professional development should be viewed as a critical component of reform. It must be linked to those same clear goals for students as well as assessment, preservice teacher education, school leadership, resources, and staffing.

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