A revolutionary model of professional development

by Christine Anne Royce

Most professional development for educators has barely changed since the late 1950s and 1960s, which is often known as the golden age of science reform (Dass and Yager 2009). Generic training sessions for teachers that are disconnected from the teacher's specific and individual needs have been the status quo throughout the past several decades. It is now time to rally the forces—let this be the start of a revolution—to change the model of professional development we both employ and accept.

With any model, there are inherent trade-offs. As educators, we make decisions to use a certain type of model to illustrate key points that are often abstract in nature—take for example a model of the solar system. One model may successfully illustrate the relative size of the planets with respect to each other, but not in relationship to their distance from the Sun. While the model assists students with the concept being presented, it often produces misconceptions if other concepts are not explicitly addressed. When selecting any model, the desired outcome (which includes the content and information that is clearly addressed) should be carefully weighed against the trade-offs. This too must be done when selecting models and content for professional development opportunities. Each model for professional development is structured so that it contains information that is accurately and clearly provided, while at the same time it may present areas that leave something to be desired.

Professional development providers—whether districts or consultants—and individuals selecting their own professional development need to critically examine and determine the best approach or model to achieve their desired outcomes. According to the NSTA Professional Development Position Statement (NSTA 2006), when choosing professional development "a range of effective professional development models should be considered. Those selected should meet the needs of science educators and have a clear set of benchmarks and goals."

Traditionally, professional development in education has focused on three main areas: content, general pedagogy, or pedagogical content knowledge. While each area has its own purpose, I will focus on what the literature states should be included for professional development of science educators—both content and pedagogical content knowledge.

What topic should be chosen?

Districts often attempt to provide a districtwide, or at least levelwide, approach to professional development that allows them to select a particular topic—often a general topic—e.g., assessment or using essential questions to guide instruction. There are many different reasons for this: economics, ease of implementation, union pressure, and so on. While these types of inservice sessions may fall into a necessary area—that of getting everyone trained and up to an initial level of understanding on a topic—this "one-size-fits-all" method is not often effective in meeting the individual needs of teachers. Using one-shot, short-term workshops is often referred to as a "training paradigm" and emerged decades ago with the curricular reform projects of the 1960s (Dass and Yager 2009). Recent research (Banilower et al. 2008) has focused on the fact that "science teachers need ongoing professional development to deepen their content/pedagogical content knowledge and assist them in applying what they are learning to their classroom instruction" (p. 30). This point is further supported in the literature and various studies over time. Park Rogers et al. (2007) found that professional development is most effective when content is relevant and applicable to a teacher's classroom. In 2008, a cross-state analysis conducted by the Council of Chief State School Of-

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ficers showed that not only did the content of professional development programs matter, but "significant effects of professional development programs for teachers of math and science were found when the programs include focus on content knowledge in the math and science subject areas, plus training and follow-up pedagogical content knowledge" (Blank, de las Alas, and Smith 2008, p. 1). Why then has the professional development model of one-shot, disconnected trainings persisted? While this question has not yet been answered, the beating distant drum of the revolution has begun. The Carnegie Corporation of New York convened a panel in 2007 that developed a report, released in 2009, calling for just such change, *The Opportunity Equation: Transforming Mathematics and Science Education for Citizenship and the Global Economy* (2009). Specifically, this report encourages school districts, state education agencies, and the federal government to cease support for professional development in math and science that is disconnected from teaching practices, and replace it with "strategic and coherent collaborative offerings that link coherent, sustained professional learning, rich in relevant science and math content…to instruction in schools" (Carnegie Corporation of New York 2009, p. 9).

The key point is that the model of professional development implemented needs to move away from the often-used "training paradigm" toward the individualized approach that involves a more focused view on the content and pedagogical content knowledge that science educators need.

Who benefits from a revolution?

The quick and easy answer to this is that everyone benefits—students, staff, and colleagues. However, a revolution is not quick and easy. Effective professional development should include three overarching key principles, which are outlined in the NSTA Position Statement on Professional Development in Science Education (NSTA 2006), regardless of the subject area or grade level the professional development is geared toward. These principles include the following:

- Professional development programs should be based on student learning needs and should help science educators address difficulties students have with subject-matter knowledge and skills.
- Professional development programs should be based on the needs of science educators—of both individuals and members of collaborative groups—who are involved in the program.
- Ongoing professional development initiatives should be assessed and refined to meet teachers' changing needs. Professional development should focus on student learning and address the teaching of specific curriculum content.

Dass and Yager (2009) provide a detailed set of guidelines that discuss the shifting emphasis and thus the need for a change in the professional development of science educators. These guidelines discuss shifts such as the following:

- District-level, one-size-fits-all programs → School-based learning tailored to the needs of all students in the building.
- Experts telling teachers what to do → Teachers taking an active role in their own growth.
- Fragmented, one-shot training → Coherent, long-range learning.

The National Staff Development Council (NSDC) encourages teachers and administrators to implement a professional development system so that "every educator engages in effective professional learning every day so every student achieves" (2009). To do so, the NSDC recommends that schools and districts implement ongoing and sustained professional development opportunities for teachers. Kennedy (1999) goes one step further and states that research studies in professional development found that "the content of in-service programs does indeed make a difference and that programs that focus on subject-matter knowledge and on student learning of particular subject matter are likely to have larger positive effects on student learning than are programs that focus mainly on teaching behaviors" (p. 25). Darling-Hammond et al. (2009) support the idea that professional development should focus on student learning and address the teaching of specific curriculum content, but go on to state that "relatively few U.S. teachers engage in intensive professional collaboration around curriculum planning" and that "half of all U.S. teachers are dissatisfied with their opportunities for professional development."

How to start a revolution

Revolutions do not come easy—they change the current, status quo model and replace it with another. In order to pursue a revolutionary model of professional development, educators must speak out about their needs and provide the supporting research to accompany their requests for differentiated professional development. One of the supporting points about what science education professional development looks like is best summarized by Loucks-Horsley, Stiles, and Hewson (1996), who state, "Teachers, like students, best learn science and mathematics by doing science and mathematics, by investigating for themselves and building their own understanding, as opposed to being required to memorize what is 'already known'" (p. 2). What we know to be true for students also applies in this situation to adults. Park Rogers et al. (2007) also concur that professional development is more effective when it engages teachers in learning content through modeling and in similar manners to how their students will learn, and allows teachers to form collegial relationships through networking with other teachers and the facilitators. "By providing opportunities for in-depth exploration of content and engagement of educators in modeling the instructional process, we will be able to focus on the needed differentiation in the professional development of science educators, just as we do when we focus on the need for differentiated instruction for students" (Royce 2010, p. 9).

If districts and individuals consider the three main points of sustained professional development that meets the content and instructional needs of each individual, consider how and why this will impact student learning, and allow for opportunities to differentiate the learning and build collegial networks, we will then be better able to meet one goal identified in *The Opportunity Equation,* which states, "To lead a revolution in math and science education, teachers themselves need opportunities to experience powerful math and science learning" (Carnegie Corporation of New York 2009, p. 9).

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