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ABSTRACT

The Partnering for Elementary Environmental Science program provides a professional development model to improve elementary science education. The program pairs teachers with science content experts and instructs the partnership teams in the pedagogy essential for effective inquiry science. This paper reports a year-long qualitative study of nine teachers involved in the program. The purpose of the study was to investigate the impact of the partnering relationship on the teachers' views of science and science instruction, on their patterns of thinking about and planning for science, on their perception of themselves as science teachers, and on their instructional behaviors. Teachers were interviewed to document their attitudes and practices with regard to science instruction prior to the training they received in the partnering program. Partnership teams tape-recorded any planning sessions held in a six-month period to document changes in their perspectives regarding science teaching. Teachers maintained science teaching logs of their science lessons. Data from interviews, planning sessions, and science teaching logs were organized and analyzed using content and cluster analysis techniques. Teachers developed strong connections with partners and a sense of esteem from the mutual efforts and satisfaction in what they created. (Author/PVD)

With a New Lens: How Partnering Impacts Teachers' Views of and Approaches to Teaching Science

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The Partnering for Elementary Environmental Science program provides a professional development model to improve elementary science education. The program pairs teachers with science content experts and instructs the partnership teams in the pedagogy essential for effective inquiry science. This paper reports a year-long qualitative study of nine teachers involved in the program. The purpose of the study was to investigate the impact of the partnering relationship on the teachers' views of science and science instruction, on their patterns of thinking about and planning for science, on their perception of themselves as science teachers, and on their instructional behaviors.

Background

Calls for reform, especially in the areas of mathematics and science education, have led educational leaders to reexamine the elements of effective professional development. Honig (1994) points out that a persistent problem with efforts to improve education is that they typically are not organized around improving teachers' knowledge of content or enhancing their ability to collaborate to improve instruction. Therefore, reform efforts have had little impact on instruction.

Sparks (1994) delineated three ideas to impact professional development for the next decade. One of these ideas is that professional development must be results-driven. This means that the success of professional development programs is judged not by how many teachers and administrators participate or by how satisfied they are with the program, but by whether the program alters instruction in ways that benefit students. A second idea impacting professional development is systems thinking. This suggests that collective, not individual, efforts are needed to improve student performance. Instructional change, then, depends on successful networking among education professionals that focuses attention on instruction and learning, provides nurturing to schools, and brings schools and community members together to broaden perspectives and offer needed collegial support. Third is the notion of constructivism: that teachers must design their own professional development programs which are job-embedded.

More recently, Loucks-Horsley, Stiles & Hewson (1996) synthesized principles of effective professional development for mathematics and science education from a variety of national standards and related materials. They noted a "great deal of consensus" regarding effective professional development approaches. These included: a) providing teachers with opportunities to develop knowledge and skills and to broaden their teaching approaches so that

they can create better learning opportunities for students; b) using instructional methods with adults which mirror the methods to be used with students; c) building and strengthening collaborative professional exchanges among teachers; d) consciously providing links to other parts of the education system and community; and e) preparing and supporting teachers to serve in leadership roles.

In the early 1980s, the federal government began to advocate school-business partnerships as a vehicle for educational reform. By 1989, the Department of Education estimated that over 140,000 school-business partnerships existed nationwide (Rigden, 1991). The partnerships took on a variety of forms ranging from providing equipment or financial support to the school with no direct involvement with teachers or students, to "popping in and doing a few 'gee whiz' things" (Sills, Barron & Heath, 1993). It is uncertain, however, that these partnerships resulted in meaningful experiences to enhance teachers' knowledge and skills, truly collaborative efforts, or fundamental changes in instruction. Miron and Wimpelberg (1989), for example, found that only eight of the 450 local school-business partnerships they investigated led to instructional change. According to Cobb and Quaglia (1994), many partnerships achieve worthwhile objectives, but many also fail in their attempts to impact instruction or improve student learning.

More recently, partnership efforts have focused on what Sills et al. (1993) call the "next generation of partnerships." These reform-based partnerships intend to go beyond compiling good projects to impacting instruction, student learning, and teacher empowerment. Among other things, successful reform-based partnerships: a) are innovative and pioneering; b) are guided by collaboratively developed goals and programs; c) reflect national and state goals; and d) embed changes within the system. Cobb and Quaglia (1994) point out that a supportive, collaborative relationship is essential to effective partnerships. That is, having a content expert in the classroom does not automatically result in enhanced instruction and learning. This occurs "when teachers and scientists develop good working relationships, when they move forward together on an experiential curriculum, and when scientists become a normal presence in the school" (Sills et al., 1993, p. 69).

Partnering for Elementary Environmental Science is a program to improve elementary science education through long-term, reform-based partnerships. The project is a collaborative effort among The Ohio State University Mansfield campus, the Ohio Department of Natural Resources, and the Science and Mathematics Network of Central Ohio which is a consortium of local school districts. This paper looks beyond the impact of teachers' training in inquiry science on their instruction and on student learning, which have been well documented and previously reported (Bainer, Barron, & Cantrell, 1995; Bainer, Barron, & Cantrell, 1996/97; Bainer & Williams, 1996; Science & Mathematics Network of Central Ohio, 1997). Instead, it investigates the impact of the partnering relationship on teachers' views of science and science instruction, on their patterns of thinking about and planning for science, on their perception of themselves as science teachers, and on their instructional behaviors.

For the purpose of this paper, the term "partnership" refers to a relationship between two or more individuals or agencies, at least one of which is an educator, school, or school district. The term "resource professional" refers to an individual from a natural resources agency with science content expertise who engages in a working relationship with educators for the purpose of sharing that expertise to impact education.

Method

Nine of the 39 teachers participanting in the program beginning in 1995 were involved in this study. These elementary grade teachers were involved in four separate partnerships in different school systems in two counties: two partnerships with three teachers and one resource professional, one partnership with two teachers and one resource professional, and one partnership had one teacher and one resource professional.

To examine the impact of partnering on the professional development of teachers, data were collected over a seven month period from June 1995 through January 1996. Teachers were interviewed, using open-ended questions, to document their attitudes and practices with regard to science instruction prior to the training they received in the partnering program. Interviews were also conducted in January 1996. Second, partnership teams tape-recorded any planning sessions held between June 1995 and January 1996 to document changes in their perspectives regarding science teaching. Further, teachers maintained science teaching logs of their science lessons for one-week periods in each month from September through January. Logs recorded the lesson length, topic and objectives, roles of instructors, student responses, and instructor's reflections on the lessons. Interviews were audio-recorded and transcribed to provide an accurate record of the interviews for analysis. Audio-recordings of planning sessions were reviewed and discussion pertinent to the research questions was transcribed. Finally, information from teachers' science teaching logs was organized into a matrix for analysis of teacher behaviors, student behaviors, and teacher reflection. Data from interviews, planning sessions, and science teaching logs were organized and subsequently analyzed using content and cluster analysis techniques.

Results

Analysis of teachers' comments and logs are presented below with respect to the four foci of this study.

1) Teachers' views of science and science instruction - All teachers in the study said that they were more confident in their knowledge of science because of the partnership. Teachers viewed the resource professional as the key in developing teachers' content knowledge. Teacher quotes show that teachers saw science differently because of the partner. The partner led them to see science as a natural way of looking at the world...to see science "through a different lens," and to see science in the simplest things and as a regular part of everyday life. Further, teachers' appreciation of science was enhanced by working every week with people for whom environmental concerns had environmental concerns as a "real priority

in their lives."

In addition, teachers reported greater use of science vocabulary from working with resource partners. Analysis of logs showed that all lessons taught collaboratively with resource persons were "hands on" or inquiry-oriented. The confidence generated by the collegial support carried over into lessons taught without the partner's assistance. Logs showed that 52% of the lessons at the beginning of the year were active, but 79% of the science lessons taught later in the year were activity-based. Finally, logs showed that teachers increased the time spent in science instruction by 60% by the end of the year.

2) Patterns of thinking about and planning for science - A recurring theme among teachers was that, as a result of working with a science partner, science became a higher priority in the curriculum. One teacher described herself as a "basal science teacher" prior to acquiring a partner, but as teaching "more like whole-language science" with a partner. Three teachers noted that science became a focus of the curriculum, with other subjects integrated into it. Previously, science was pulled in when it was convenient or an obvious but secondary link. These teachers began to think of science as a central interest and an "on-going thing," rather than as a minor, compartmentalized subject. Teachers began to develop a greater sense of ownership over science teaching as a result of partnering, and to spend much more time in its planning and preparation.

Planning and teaching as part of a partnership compelled teachers to think through their plans with greater care and to use very precise language in articulating those plans. Further, teachers' conversation and mutual accountability extended their thinking and promoted reflection on the deeper purposes and implication of their plans. The tapes of their discussions show "iron sharpening iron" as they refine objectives, plans, and approaches.

3) Perceptions of themselves as science teachers - Rather than being bound to "cover" certain topics in the curriculum, teachers began to take ownership of the science curriculum through the year-long plan which they developed with science partners. They expressed excitement at seeing the students' benefit when they grew away from their usual sequential pattern of teaching science. They expressed a greater sense of freedom to explore things with their students without the dictates of their planned activities. Teachers talked of being more willing to take risks and they attributed their risk-taking to the support they received from their partners. One teacher spoke of the partner being there: "I am more willing to take risks - because if I'm going to fall my partner is going to be there to catch me."

Because they had a new concept of themselves as science teachers, six of the teachers reported that they had dramatically increased their reading and study of science information and joined science organizations. Many shared that their science partners had given them greater awareness of science resources and helped them build important networks.

4) Instructional behaviors - Teachers recognized that what they created during their year of partnering was a significant qualitative change from normal practice and distinguished

them as a learning community. During the year, teachers engaged in partnerships witnessed the interest and curiosity of colleagues both within and outside of their schools and they received the appreciation and support of parents for their efforts. One teacher shared with considerable emotion that she had done things this year that she would never have attempted by herself. The experience helped her see greater possibilities and made her willing to try new things - "to do real science."

Conclusion

In short, this study shows that nine teachers developed strong connections with partners and a sense of esteem from the mutual efforts and satisfaction in what they created. Therein, one teacher remarked,"The partnership has become a big part of who we are - our identity." Long-term partnerships between teachers and content experts are an example of creating a circle of communication among educators within the larger education community which, at least for these teachers and classrooms, had significant impacts on teachers and on science instruction. This study suggests that partnerships should be considered seriously as vehicles for professional development of science teachers. It suggests a need for further research at the microlevel to fully understand the dynamics and benefits of partnerships for reform science education.

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