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Professional development as an ongoing conversation

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Abstract

While professional development (PD) for teachers exists in many forms, no particular one emerges as the best way to facilitate change in classroom practices. Evidence from the Elementary Science and Technology (EST) project suggests that a variety of PD is essential. Also emerging is the importance of developing and sustaining school-university partnerships and professional communities of practice.

This paper describes the results from steps 1-4 of a six-step program of research in which two faculty instructors taught Grade 6 students a science or technology unit while six teachers worked alongside the students to complete the same unit. Data collection for each step included two written questionnaires, a focus group interview, and teacher field notes written during the professional development.

The results of the study are being used to address the following research questions:

(a) to what extent does in-service given in a classroom context help teachers acquire a pedagogy for elementary technology or elementary science?
(b) to what extent does in-service given in a classroom context help teachers acquire subject knowledge in elementary technology or elementary science?

Keywords

professional development, design and technology, pedagogy, elementary education, science education

Introduction

Professional development (PD) for classroom teachers currently exists in many forms. While research points to several crucial elements in effective professional development, as yet no one form emerges as the best way. Recent research suggests the importance of developing and sustaining school-university partnerships and professional communities of practice in the teaching profession (National Research Council, 1999). What is not so clear is how teachers learn in and through professional development experiences and if and how they apply their learning. Empirical research that illustrates how teachers experience and describe their professional development learning may provide another link in understanding and fostering the increasing expectations to document the nature of professional growth.

The next section of this paper provides an overview of the literature describing crucial elements in effective professional development for teachers. This is followed by a brief description of the Elementary Science and Technology (EST) project and its approach to teaching science and technology, and the professional development provided to teachers in response to their emerging requirements while writing curriculum materials. Finally, the paper reports some results of a study designed to investigate the effectiveness of a professional development experience given in a classroom in which Grade 6 students completed a technology unit or a science unit. The study addressed two research questions:

(a) to what extent does in-service given in a classroom context help teachers acquire a pedagogy for elementary technology or elementary science?
(b) to what extent does in-service given in a classroom context help teachers acquire subject knowledge in elementary technology or elementary science?

Professional development for teachers

Single-event professional development activities (e.g. daylong sessions), what Shanker (1996) refers to as 'one-shot workshops' and what Little (1993) calls an 'implementation-of-innovations' model, are the most frequent form of professional development for teachers. While such PD may be useful for introducing ideas, it does not facilitate change or noticeable improvements in classroom and

professional practices (Osterman and Kottkamp, 1993). Furthermore, these single-event activities typically assume an inappropriate stance toward teacher change. They present ideas, give tips, provide handouts, project a certainty about the topic, and assume that the giving and receiving of public knowledge will lead to behavioural change. According to Little (1993: 156), single-event professional development activities 'can, at best, be used to *suggest* new classroom practices'.

Research has identified four crucial elements in professional development that leads to positive change in the classroom. First, professional development must provide a challenge to teachers' frames of reference (Carney, 1998). It must challenge teachers to investigate, experiment, consult, and consider outcomes: to take a stance of critique and inquiry toward practice (Ball, 1996). Teachers must be encouraged to use an inquiry and problem-solving paradigm that results in their producing new knowledge, rather that a training paradigm that results in their consuming knowledge.

Second, professional development must be situated in relevant contexts if teachers are to learn and apply new knowledge (Carney, 1998). The import of learning contexts has been recognised by numerous scholars who refer to situated learning and sociocultural contexts (Lave and Wenger, 1991; Rogoff, 1994). Grossman (1992: 34–52) argues that teachers must be able to situate new knowledge and understanding in the specific context of classrooms.

Third, collaborative support has been shown to greatly increase the likelihood that changes in practice will be sustained (Fullan and Stiegelbauer, 1990). Smylie (1996) notes that since learning is incremental and teachers do not change their practices overnight, professional development should be long-range and ongoing. Teachers need colleagues with whom to focus on problems of teaching and learning, to work out how to deal with new subject matter, and to engage in innovative work aimed at curriculum reform (Olson, 1997: 13–26).

Fourth, reflection is described as a basic source of learning and change (Louden, 1991). Schön (1987), for example, demonstrated the importance of *reflection-in-action* and *reflection-on-action* for the development of professional practice. Other researchers emphasise that professional development must provide opportunities for teachers to form 'communities of practice' (Lave and Wenger, 1991) that encourage them to reflect on the content and contexts of their pedagogy. A collaborative approach is based on notions of teachers as colleagues engaged in inquiry about practice (Lieberman and Miller, 1990).

The Elementary Science and Technology Partnership

The Elementary Science and Technology (EST) Partnership involves a collaboration between the Faculty of Education at Queen's University and two local School Boards. A three-year project, it has as one of its primary goals the provision of professional development for a group of teachers implementing a new Grade 1–8 science and technology curriculum (Ministry of Education and Training, 1998). This curriculum poses significant challenges for elementary school teachers about how to teach the subjects, how to assess students' learning in the subjects, and how to use the document to plan units of work (Barlex *et al*, 2000: 34–39; Welch *et al*, 2000: 180–185). This is especially so for those teachers who do not have a science or technology background.

During its first 18 months, EST provided a range of ongoing professional development experiences, including practical workshops (in both science and technology), seminars, writing days, tutorials, and conversations by telephone and e-mail (Welch et al, 2001). In the practical workshops in both science and technology, teachers completed a unit of work (a Big Task and its associated Support Tasks) in order to gain new subject knowledge. In the seminars, teachers were able to put their professional development in the context of current educational issues (e.g. assessment, meeting curriculum expectations, and the proposed pedagogy). On the writing days, teachers worked collaboratively to plan and develop curriculum units. Tutorials provided each teacher an opportunity to work one-on-one with a consultant in refining their curriculum unit. E-mail was used to maintain on-going conversations with teachers about their curriculum units as they were written. Conversations by telephone dealt with specific day-to-day problems as they arose.

The next section of this paper describes a six-step program of research entitled *In-service in context: Learning science and technology with students in elementary classrooms* (ISIC) designed to investigate an innovative form of professional development and to respond to ongoing concerns of EST teacher partners.

Method

In Step 1 of the ISIC research program, two faculty instructors (the authors) taught a technology unit entitled *Pop-up Pals* to a class of 27 Grade 6 students for one school day. The teaching occurred in a large classroom in the school of one of the EST teachers. The design brief for this unit reads as follows: *Design and make a pop-up book that will amuse and intrigue a particular reader. The book may be for you or for someone else*. Prior to tackling this design and make activity (DMA) the students completed eight support tasks to

learn a variety of paper engineering techniques, illustration styles, and how to write a design specification (Barlex, 2000). Concurrently, six teachers from the EST project worked alongside the students to complete the same unit.

In Step 2 of the research the same two faculty instructors taught a science unit that required Grade 6 students to answer the following question: *Why is it important to classify things?* Prior to answering this Big Question, students completed six support tasks to learn about classifying objects, classifying living things, how to use and create a classification key, and how scientists classify vertebrates and invertebrates. Once again, the six teachers from the EST project worked alongside the students.

In Steps 3 and 4, the faculty instructors taught the same science and technology units to Grade 6 students while six non-EST teachers worked alongside the students. In Steps 5 and 6 two EST teachers will teach the two units to Grade 6 students and six non-EST teachers. Data collection for each step includes a pre and post in-service questionnaire, teacher field notes written during the professional development, a focus group interview, and a faculty debriefing to reflect on the successes and challenges of the day. This professional development afforded teachers an opportunity to:

(a) participate in an approach to teaching science or technology
(b) to acquire knowledge, skills, and understanding
(c) to reflect on issues related to teaching and learning elementary science and technology.

Data was collected in a variety of forms and in three phases of the study. Phase 1 occurred prior to the unit being taught. A written questionnaire was used to identify:

(a) teachers' current knowledge and skills
(b) teachers' current knowledge about teaching science or technology.

Phase 2 of data collection occurred while the students and teachers were completing the support tasks and Big Task. Teachers were asked to record their thoughts about teaching and learning science or technology in a prepared field notes booklet. Phase 3 occurred after the unit had been taught, and had two components. First, a second written questionnaire was used to identify:

(a) teachers' post in-service knowledge and skills
(b) teachers' post in-service knowledge about teaching science or technology.

Second, the researchers conducted a focus group interview with the teachers. Data from the first questionnaire and the events of the day guided the nature and structure of the focus group interview. Analysis of the focus group interview involved thematic analysis and concept analysis (Miles and Hubermann, 1994; Silverman, 1993). Initial coding categories were identified by both teacher educators individually and then compared and checked for consistency before final coding categories were derived.

The remaining sections of this paper focus on insights from teachers participating in Steps 1–4 of the study and how these reveal how the ISIC experience helped them learn and grow as teachers.

Results

Thematic and concept analysis of field notes booklets, questionnaires, and focus group interviews reveals a common thread of experience and emphasis by teachers. Two distinguishing features include:

a) teacher emphasis on the importance of their learning with students for their professional development
b) new questions about teaching and learning prompted by the professional development experience.

This paper focuses on the importance for teachers of learning with students.

Learning with and learning from students

The unusual opportunity to work alongside students prompted experienced teachers to reflect upon their own learning, children's learning, and to examine their teaching practices from new perspectives. Teachers commented on how they learned and gained a unique insight into student learning by observing students' interactions as they tackled both the support tasks and the Big Task.

> 'It was … wonderful to sit as part of the group and really see the interactions [between students] and what goes on.'
>
> (Teacher 2)

> 'Seeing the students go through the activity, observing their actions and interactions allowed me to assess each stage [of their thinking].'
>
> (Teacher 6)

> 'The types of observations I made were totally different … the fact that I was able to make observations of children was unique to any in-service.'
>
> (Teacher 2)



Figure 1: Learning by observing students.

Teachers' responses also reveal the importance they attach to listening closely to students while working with the group:

> 'If a teacher is not completely immersed in the experience as we were today, they don't pick up the info and pointers that the children are offering in their groups, the frustration in some activities.'
>
> (Teacher 1)

> 'Being with the kids today made me realize as I heard them speak we presume a lot as teachers of what they should already know.'
>
> (Teacher 10)

> 'What I really like about getting in a small group with them, you're privy to that conversation, which as a teacher at the front you don't usually get.'
>
> (Teacher 5)

Teachers' comments also reveal that participating with students in a group as learners was an important part of the professional development experience:

> 'You could learn along with the kids, through trial and error experiences.'
>
> (Teacher 4)

> 'I think interacting with students as part of in-service is very beneficial – how else can we understand how this type of teaching will affect them.'
>
> (Teacher 2)

> 'It was great to be able to interact with the students and see what issues would arise. There are always things that you cannot prepare for but by doing it in context you are more likely to get a real feel for how things will/should really run.'
>
> (Teacher 5)

> 'WOW! You really have to deal with the model in-context to realize the reality of what happens in science and technology classrooms. By putting myself in the shoes of a student, I realize that we assume too much prior knowledge and sometimes go too fast when we think they should I get it. I saw the model really work!'
>
> (Teacher 10)



Figure 2: Learning by participating with students.

Discussion

Despite a large number of professional development days at the faculty, teachers participating in the EST project expressed the need to better understand how students would respond to some of the pedagogical ideas introduced and practiced on PD days at the faculty. Teachers' questions inspired the authors to design an alternate context for professional development, one that included students. To date, two groups of teachers, one familiar with the EST model and one for whom it was entirely new have worked and learned alongside students.

ISIC situated professional development in a relevant context by conducting professional development in a classroom with students. This provided teachers with the opportunity to observe two instructors team teach a class of children, to see the EST model being taught, to become an insider in a small group of children, to actively engage in the tasks, and to reflect-in-action. Vukelich and Wrenn (1999) believe that professional development should be based on the participants' interests and needs. Cameron (1996) suggests that professional development must be relevant to actual classroom work and to what students need to know and be able to do.

As participating members of a group of Grade 6 students, teachers gained a rare perspective on student learning. No longer were they outsiders briefly observing and attending to several groups in a classroom at the same time. Teachers worked and

learned with students as insiders in their groups. They observed firsthand how students responded to the support task/Big Task model, in contrast to usual forms of professional development, in which they observe other teachers working. As participants in a group required to do the same work students were doing, teachers assumed the role of a learner and to some extent that of a peer.

Being in the group to listen to students' comments and to observe their reactions provided teachers with insights they usually are not able to access. As a teacher overseeing many groups in a classroom their opportunity to listen to the interactions with each is, of necessity, limited. Further, teachers rarely have an opportunity to watch other teachers teach and to critique how pedagogical practices affect students.

The study has also shown how collaboration between two school boards and a faculty of education can enhance professional development opportunities; opportunities for reflection, shared critique, supported change, and research. ISIC has manifested an approach to research aimed not only at generating new knowledge and theory but also at addressing the immediate, everyday problems faced by teachers implementing a new curriculum. The ISIC program of research may be seen as a form of action inquiry, being characterized by four basic elements: collaboration, a focus on practical problems (curriculum implementation), an emphasis on professional development, and a necessity for time and support of on-going communication.

ISIC continues to provide rich opportunities for continuing a conversation about teaching and about learning. These conversations with teachers prompt the authors, as teacher educators and as professional development leaders, to continuously reflect upon our assumptions about PD and to change the ways in which we conceptualize PD. We seek to produce new knowledge in conversation with teachers. We seek to challenge teachers to take a stance of critique towards their current teaching practices.

Conclusion

Both the EST project and ISIC research are demonstrating that educational partnerships have the potential to be generative and professionally beneficial for both teacher educators and classroom teachers. Ultimately, teacher candidates and children benefit from school-university partnerships as they seek to improve the quality of teaching and of learning. Participants recognise that the collaboration has facilitated mutual professional development in ways that benefit us all. Both EST and ISIC are making clear that professional development needs to be regarded as a continuous cycle of learning, practice, and reflection with colleagues. Time and guidance are required if professional development is to become an ongoing conversation of reflection and change. Changing the nature of professional development has the potential to change the profession at its heart. Using teaching and learning experiences in schools to inform programs in teacher education requires increasing research attention.

Recent reports (National Academy of Education, 1999; National Research Council, 1999) call for more collaborative forms of research where researchers and professional educators work together to improve educational practices. Moreover, reviews of the literature identify a need to examine the nature and scope of school-university collaborations to better understand what teacher educators and teachers learn, and how to sustain these partnerships (Cole and Knowles, 1996). This study supports the view of Lee and Shulha (1999), which encourages educational researchers to consider the various dimensions and possibilities that exist for collaborative work.

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