Building Technology-Based, Learner-Centered Classrooms: The Evolution of a Professional Development Framework

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This study examined issues in supporting middle-school teachers to become more learner centered when implementing computer-based, workplace simulations in their classrooms. Specifically, this report focuses on a participant observation study of two teachers to develop and evolve a framework for professional development. The framework was developed based on prior professional development efforts, information on developing learner-centered classrooms, and data about teacher change. The framework included five key pieces: (a) reflection, (b) proximal goals, (c) collegial support groups, (d) one-on-one feedback, and (e) support materials for the teachers. The foundation for the framework was a belief that change is individual and needs to be supported in context and over time.

The data included field observations as the teachers used the simulations in their classrooms made by the author and three outside observers, and interviews with each teacher following her use of the simulation program.

During the four-month study, the original framework evolved in response to the data collected. The final version of the framework focuses on the professional developer working with teachers to develop reflective skills. Proximal goals became a focusing tool for reflection after teachers had begun to develop their reflective skills. The interplay between reflection and proximal goals was enhanced by outside resources, one-on-one feedback, and collegial group meetings.

☐ Educational improvement is the central focus of this participant observation study. In this instance, improvement means creating learner-centered environments through the use of computer-based simulations that were designed to be learning tools for students and curriculum reform tools for teachers. The purpose of this study was to develop an understanding of what kinds of approaches can support teachers in becoming more learner centered (McCombs & Whisler, 1997) while using the simulations. For this study, the goals included helping teachers shift from being didactic providers of information to being facilitators; supporting teachers in becoming expert questioners rather than simply subject matter experts; and developing the skills necessary for guiding student learning by focusing on finding and interpreting information to solve a problem. These goals require that traditional teachers make a philosophical shift from seeing themselves as question answerers to becoming question askers (e.g., Brooks & Brooks, 1993).

In previous work, the research team I was a part of found that the effectiveness of the existing professional development for implementing the simulations had been less than desired (e.g., Hawley & Duffy, 1998). In an effort to see the potential of the simulations realized, I chose to explore a different model for helping teachers integrate the simulations into classrooms.

Specifically, it was the goal of the research to explore the question: How can teachers be supported in becoming more facilitative and learner centered as they use these simulations? To move toward answering this question, I first developed a framework that combined a series of strategies that had been successful in similar

professional development efforts. Next, I focused on an implementation of these strategies to evolve my understanding of professional development. Finally, based on the results of this four-month study, I revised the framework.

> Once upon a time . . .
> I guess in the beginning, I thought the textbook was all I needed to teach them. But, I've come to find out that it's not all that I need. And, I don't want to shoot myself in the foot, but if the year was longer, I could do a lot more with them in terms of making them do research. Finding out information about different things. As opposed to just trying to give them this surface things that you get out of the textbook . . . you have to give them some basics—some fundamentals—that's what you need the book for. So, how to blend it. . . . You just can't say, go out and find out about this and they don't have any background, so I have to find a way to give them enough background so that they can go out and then keep coming back—it's a balancing act. (Interview with Therese Collins)

It was only two weeks before the end of my work with the teachers in New York when Therese reflected on her evolution in thinking about teaching. While she never said that my work with her had contributed to this change, the level of reflection that she demonstrated in her statement left me with little doubt that my professional development framework had somehow influenced this evolution toward inquiry-based learning and toward the development of a learner-centered environment. Certainly, Therese was still in the middle of a major conceptual shift from thinking about teaching as providing information to thinking of learning and creating learning environments. She still held tight to the notion that some content needed to be covered thoroughly before more student-centered methods could be employed. However, she was indicating a desire to implement more inquiry-based and project-based approaches.

At this point, I had been working as a participant observer in Thacker Middle School in New York City for nearly four months. The goal of my research was to develop an understanding of how to support teachers in becoming more learner centered while they used computer-based workplace simulations. In order to focus the work, I had developed a framework of professional development based on the successful efforts of others. Acting as the participant observer allowed me the freedom to alter my enactment of the framework as necessary as we went along as well as to develop a richer understanding of the contextual issues that surrounded the teacher change effort I was introducing.

BACKGROUND

During the three years leading up to this study, I was part of a research team looking at the workplace simulations developed for middle and high school students from various perspectives. The work we did pointed to some shortcomings in the way teachers were approaching the simulations (e.g., Center for Innovation in Assessment, 1998; Hawley & Duffy, 1998) which indicated that there may be shortcomings in the teacher preparation being provided by the software company, Classroom, Inc. (CRI).

The software itself allowed students an opportunity to work in groups to solve real-world problems. In each simulation, student teams of three or four took on a professional role. For example, students might become bank tellers, hotel managers, or paper company managers depending on the simulation they were using. In each simulation, students worked a number of scenarios, each dealing with a different problem. Each scenario provided the student with an array of relevant information that came from a variety of sources (the TV, other employees, files, phone calls, etc.). At the end of each simulation, students were asked to make a decision based on the information gathered. These answers were multiple choice and the students were provided with feedback about the "correctness" of the chosen answer. The quality of thinking required by these questions varied greatly from one simulation to another. Most of the simulations also included a few questions for the students to answer at the end of each unit. The programs were designed so that the teachers could print these answers for evaluation.

Because the simulations were designed to be change agents for teachers to create learner-centered environments focused on cooperative problem solving as well as learning tools for stu-

dents ("Learning for Life," 1995), teacher professional development was a mandatory element in adoption of the simulations. CRI required that all teachers participate in a one-week orientation to the software that promoted problem solving in the classroom and using cooperative learning techniques. Once that training was completed, CRI personnel occasionally visited the teachers' classrooms to provide feedback and support. Additionally, teachers were invited to participate in workshops about once a month. Each workshop covered a single topic, such as problem solving, during a two-hour block after school. During my research for this project, half of the workshops were cancelled because of lack of interest.

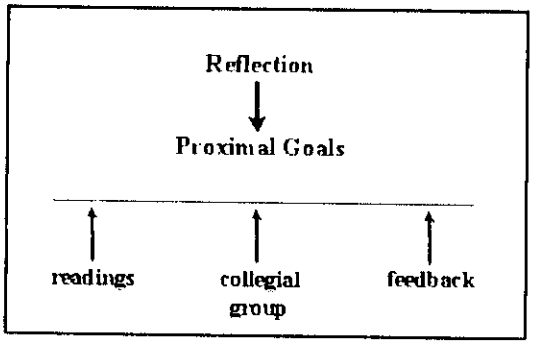
In our earlier research we found that the teachers who had gone through this traditional CRI training were only moderately successful in making the changes desirable to be optimally successful. For instance, the teachers did step back to let the students solve the problems themselves. However, in the process of stepping back, they became silent onlookers rather than active facilitators (Center for Innovation in Assessment, 1998). In fact, in one study we found that teachers were more likely to interact with students in instructionally irrelevant ways than to ask guiding questions while the students worked on the simulations (Center for Innovation in Assessment, 1998).

A PROFESSIONAL DEVELOPMENT FRAMEWORK

The promise of workplace simulations as tools for promoting critical thinking and problem solving seemed to be unfulfilled. In the CRI simulations, we were seeing slow, unpredictable changes at best. In response to the overall lack of learner-centeredness and critical thinking we had found previously, I wanted to focus on supporting teachers in becoming facilitators in a learner-centered environment. To move toward an understanding of what it meant to support teachers in making this shift, I created a professional development framework based on the professional development experiences of others (e.g., Blumenfeld, Krajcik, Marx, & Soloway, 1994; Guskey, 1986; Hannay, Bissegger, Haston, & Mahony, 1994; Little, 1993; National Commission on Teaching and America's Future, 1996; Richardson, 1992; Stein, Smith, & Silver, 1999; Wedman, Espinosa, & Laffey, 1998;) and on several models of teacher change (e.g., Borko & Putnam 1995; Corno & Randi, 1999; Dwyer, Ringstaff, & Sandholtz, 1991; Mevarech, 1995). Then, through a participant observation study, I implemented and refined the framework, developing new understandings along the way.

The professional development framework developed for this research drew on the experiences of experts and the successes of similar professional development efforts. Based on the work of leaders in the professional development field (e.g, Darling-Hammond, 1997; Guskey, 1986; Little, 1993; Richardson, 1990), I aimed to create a model that allowed teachers to own their development (McCombs & Whisler 1997), to be supported individually in the context of their classroom (e.g., Guskey, 1986; Hannay et al., 1994) and to break through the feelings of isolation typical to teachers implementing innovations. I also recognized the need for the framework to be sensitive to the individualized nature of change and the need for support over time (Guskey, 1986). To this end, I synthesized the research to develop a framework (Figure 1) that addressed the needs of the teachers as they incorporated the CRI simulations in their classrooms. The basis of this framework was reflection on the implementation of the proximal goals that were conceptualized as the centerpiece of change. Underlying this reflection on

Figure 1 ☐ Initial Professional Development Framework.



the goals were the support elements—resources such as readings to further evolve each teacher's understanding and practice, a collegial support group, and individualized feedback from a professional developer.

Central Aspects of the Framework

The principal focus of this framework was to be reflection on the implementation of proximal goals. In order to provide the teachers with a sense of direction and accomplishment, proximal goals were at the center of this model. Proximal goals, which are small, easily achieved goals that help move the learner toward a larger, distal goal, have been shown to raise efficacy levels in learners (e.g, Bandura & Schunk, 1981). My hope was that including proximal goals would allow the teachers to maintain high efficacy levels as they moved through the change process. Efficacy was a key concern because research indicates that more efficacious teachers adopt innovations more readily than those with lower efficacy (Guskey 1988; Tschannen-Moran, Hoy, & Hoy, 1998). It has also been found that teachers who are more learner centered tend to have higher efficacy levels (McCombs & Lauer, 1997). Because my goal was to promote changes in behavior and belief that would endure beyond my tenure in the classroom, the efficacy element seemed particularly important in this situation.

The notion that reflection is important to professional development grew out of Schön's work (1987). Research has shown that promoting reflection can be a successful aspect of professional development efforts (e.g.; Corno & Randi, 1999; Miller, Bray, Vye, & Goldman, 1998; Staub, Mahon, & Miller, 1998; Wedman et al., 1998). In change processes, reflection seems to serve two purposes. First, reflection can generate the internal dissonance required to close gaps between teachers' actions and their beliefs about learning (Wedman et al., 1998). Second, reflection forces teachers to examine their work critically and make improvements as necessary. Reflection takes away the teachers' natural inclinations to act on tacit knowledge rather than well-reasoned knowledge (Richardson, 1990).

In action, the proximal goals were to be set by the teacher and me working collaboratively. In my initial thinking, the proximal goals were to build toward the distal goal of the teacher becoming more learner-centered and more facilitative. Before going out into the field, I envisioned that the proximal goals might include such efforts as asking each student group one *why* question during the course of the simulation. Then, using reflective questions would develop understanding of how the implementation of the goals went that day, how the teacher felt about the goals she was implementing, and where we should focus next. I hoped that the reflection would also help the teachers become critical evaluators of their own classroom performances, thus allowing them to see the connections between their goals for their students and how they were supporting their students in achieving the goals. In this way, reflection could help the teachers learn to guide their own development (Corno & Randi, 1999). To this end, I adapted a set of reflective questions (Staub et al., 1998) to focus on what the teacher had just completed in her classroom. Most commonly, I asked questions such as:

- How did you promote collaboration in this activity?
- What did you do to support the students in their problem solving?
- What were the goals of your introduction to this scenario?
- How did you monitor for understanding during the scenario?
- How did you push your students' thinking further?

Supporting Aspects of the Framework

To support the reflection and proximal goal work, there were three key elements: (a) readings, (b) a collegial group, and (c) one-on-one feedback. The readings were intended to provide a readily accessible library to the teachers. In this way, they modeled the same kind of information-rich classroom I wanted the teachers to develop for their own students. Further, much literature on good teaching emphasizes the importance of teachers developing a knowledge base in learning theory, pedagogical the-

ory, and content expertise (Borko & Putnam, 1995; Richardson, 1990; Staub et al., 1998). The readings chosen for this project all attempted to help teachers develop knowledge of learning theory and pedagogy.

The readings were compiled in a notebook that was indexed and sorted according to topic. Readings covered topics such as using cooperative groups, promoting critical thinking, moving toward learner centeredness, asking questions, and promoting learning. In addition to this notebook, each teacher was given a copy of *Improving Classroom Questions* (Chuska, 1995), and told that they would be able to keep these resources permanently.

The collegial group was conceived as a safe place for the teachers to share their thoughts and concerns about using the simulations. It has been shown that:

> Getting teachers together regularly in small "instructional support groups" to examine their own teaching in light of research findings can be a powerful vehicle for change . . . Several teachers mentioned that they gained the confidence to try new strategies from their support group. (Sparks, 1988, p. 117)

These kinds of groups help raise the reflectiveness of their participants (Miller et al., 1998) and support participants in moving toward their desired goals (Blumenfeld et al., 1994).

Based on previous research (e.g., Miller et al., 1998; Richardson, 1992), I expected the collegial group to start slowly as the teachers became accustomed to sharing with each other. Because of this, I anticipated that my role within the group would diminish over time until the teachers were running the meetings. I hoped the collegial group might endure beyond this research. This ongoing element is considered an aspect necessary to sustained change efforts (Hannay et al., 1994).

The final aspect of the framework was the one-on-one feedback of the facilitator. This served two purposes. First, it modeled a peer-coaching method of teaching (Showers & Joyce, 1996). In many cases, the one-on-one coaching put me in the role of the sounding board as the teacher talked through issues. Further, the mentoring aspect was an important part of bringing the professional development effort into the context of the teacher's world (Guskey, 1986; Hannay et al., 1994). It was intended to highlight things that went well during the class period and specific changes each teacher might make to improve her performance.

THIS STUDY

In enacting the professional development framework, I chose to use a qualitative approach so that I could evolve it as my understanding developed through my work with the teachers. I sought to demonstrate plausibility (Erickson, 1985) to create a picture of the circumstances, problems, and questions that affect teacher change. Using a qualitative approach allowed me to consider the implementation of the framework in a rich context (Lincoln & Guba, 1985)—that of a real school—with all the factors that influence any change effort. In order to conduct this research, it was necessary that I become a participant observer (Spradley, 1980). I acted as both the professional developer and researcher throughout the study.

The Participants

For this study, I invited teachers from one area of New York City to work with me. Of the approximately 12 invitees, only 2 were able to participate. The others were not interested, were no longer using the products, or were using the simulations too late in the school year.

Therese Collins. The teachers with whom I worked were both in the math and science magnet at Thacker Middle School. One, Therese Collins, was the seventh-grade environmental science teacher. She used a simulation in which students took on the role of the manager of a paper plant because it was well aligned with her environmental science curriculum. She had used the simulation one time before.

Therese was interested in getting her students to experience learning. Yet, Therese realized the importance of meeting preset standards and maintaining control over her class, tasks she struggled with throughout our work together.

She was trapped in a system with expectations set by a previous generation. However, she was willing to try to make the students' experience more exciting and add to it in ways that tied together the traditional and the new. Because of this, Therese's class was always full of energy and she was usually pulled in many directions at once.

Evelyn Murray. Evelyn Murray, the other teacher, was the eighth-grade math teacher as well as the professional developer for the magnet. She had used the banking simulation many times before with sixth-grade students, but was going to use it for the first time with her eighth-grade students. In the banking simulation, the students acted as tellers and customer service representatives.

Evelyn was definitely a traditional teacher. She was always dignified and professional in her approach. Her students sat and absorbed the information she presented. Evelyn always remained in control of her class and always stayed at the center of the learning. Her typical approach to teaching involved being the information provider. Her repertoire was built of time-honored classics such as having students work problems on the board and do worksheets. However, she was also comfortable enough and skilled enough to add twists such as cooperative learning or real-world stories to keep things more interesting.

Would it be fair to say that either of these teachers was better than the other? No. In fact, my outside observers could not even agree on this issue. Two observers (Duffy & Yoshida) thought Evelyn's control of her classroom was critical to building a learner-centered environment, while the other observer (Kirkley) and I felt that while Therese could not maintain control of the entire class at one time, the portion she was able to reach was really learning. The teachers had very different styles, different strengths, and different needs. These differences helped inform me about how to support them in becoming the best they could be.

The researcher as professional developer. My role as the professional developer paralleled that of a band conductor. While in the end, the teaching was only as good as the individual efforts put forth by the teachers, my job was to know what to focus on and "rehearse" more and what parts could wait for another day.

I decided the course for many of our sessions and colored the teachers' practice with my own interpretations of what teaching and learning should be. In my mind, I envisioned moving the teachers toward a learner-centered approach (McCombs & Whisler, 1997). I began the study recognizing that the image I had of a great teacher was one who was not directive and who used questioning and reflection to promote learning. I found that this notion was immediately challenged by the fact that Evelyn had been selected teacher of the year for her district and was a mentor in the school, yet her teaching was entirely teacher-centered and directive. I faced the challenge of learning how to support the teachers in finding their own way because I recognized that as a graduate student I had no right to tell the teacher of the year that her style was not exemplary. I also recognized that the teachers needed to find their own way because there were no extrinsic rewards to support the changes I was asking them to make. For example, their classrooms would likely not be orderly because of the increase in collaboration and the teachers might not be able to have all the answers anymore since the students might ask questions the teachers had not previously considered.

At times, it was easy to balance the role of professional developer and the role of researcher. In the cases where it became impossible to balance the two roles, I attempted to protect the inquiry at the expense of the professional development. This meant that I introduced strategies to the teachers rather than waiting for the teachers to indicate a need for them, used a tape recorder even though it might squelch some of the conversation, and tried to move the teachers in directions that they might not have gone naturally. However, to the extent possible, I maintained the integrity of the professional development role as I had conceived of it in my preparation for the data collection.

DATA COLLECTION

I attended Evelyn and Therese's classes each time the students worked on the simulations. During my classroom visits, I took field notes focused on teacher interactions with the students, and was able to interview each teacher after every classroom observation. These tape-recorded interviews served as both reflective conversations and as a data source. Often, the interview and reflection depended on answers to the same questions. The interview sessions also allowed me to make some suggestions about different teaching strategies, provide positive feedback on the aspects of the class that went well, and clarify any questions I had. Each interview was transcribed verbatim.

Both teachers chose to use the simulations during the one day each week when they met with the students for a double class period, because that provided them with approximately 100 minutes to introduce the simulation, have the students work it, and engage in a follow-up discussion at the end. In Therese's class, this schedule provided me with 13 weeks of data. However, I was only able to observe and interview Evelyn a total of 8 times during the data collection period because in the second month of our work she adjusted her schedule to work on the simulation only every other week. She made this decision because she thought her students needed to have more opportunity to do math, and using the simulation was taking away two class periods of math each week.

In addition to the field notes and interviews, I also videotaped each teacher at least two times during four months of data collection. I was able to use the videos from the 7th and 14th weeks of my data collection for the video analysis. Two other videos were recorded in Therese's class, however they did not contain meaningful data because of computer problems in her class those days. All four videos were transcribed and analyzed as field notes and using a checklist that focused on the kind of interactions the teacher had with the students and how the teacher was promoting higher-level thinking. Another researcher involved with the larger research effort (Kirkley) and I performed the checklist analysis. Finally, I was also able to collect some document information in the form of assignments the teachers prepared for the students, and materials outlining the school's purpose and goals.

In order to create a supportive environment for the teachers I initiated a collegial group during the data collection. In addition to Therese and Evelyn, I invited two more teachers in the magnet to join us in this group. These two teachers were team-teaching a medical simulation for sixth-grade students. Because this was their first use of the simulation and their first year as teachers, they were asked only to participate in the collegial group. Previous experience had shown that even experienced teachers struggled with technology issues in their first year of using these simulations; therefore, they were not good candidates for the overall professional development effort.

In all, there were five group meetings. The first was during Week Six of the data collection. Three participants attended all five meetings. The sixth-grade math teacher missed two meetings. During the meetings, I recorded the flow of the conversation while participating in the discussion. Because of the risk of missing or misinterpreting valuable data, I gave a copy of my notes to Therese after all but the first and last meeting to ensure I had not missed anything.

In addition to my own presence, I invited three outside observers to join me in the classroom. Two, Thomas Duffy and Jamie Kirkley, were involved with the larger Indiana University simulation research effort. The third, Makoto Yoshida, had previously worked with CRI as a research associate. Each was asked to focus on the interactions the teacher had with the students, what the teacher seemed to be promoting the most, and how the teacher was promoting problem solving. Each outside researcher took notes that were given to me, and I debriefed them about what they had seen. In all, three sessions of Therese's class and four sessions of Evelyn's class included outside observers. I added the outside observers' notes to my data pool as well as my notes from the conversations we had following each of the sessions. The notes of our conversations were typed and sent to the outside observers for member checking.

The use of multiple researchers, like the use

of multiple data-collection methods, served as a way of enriching the overall picture. It did not guarantee increased reliability, rather it expanded the interpretation and revealed elements that were not necessarily seen by a single researcher (Denzin, 1989). Particularly as time went by, the observations of these outsiders were very valuable to my understanding of the phenomenon taking place. For instance, while I could see the small steps from within the project, they brought in the more idealistic expectations that I was slowly releasing over time. They allowed me to have an insider's view and an outsider's perspective simultaneously. The data from these observers were used in my analysis of the cases—they added a depth that would have been missing if only my view had been present. More importantly, the outside observers often helped steer the research by pointing out things I had missed in my own observations and by suggesting some different approaches I might use with the teachers.

DATA ANALYSIS

Data analysis was ongoing. I kept a field journal to track my thoughts and assumptions throughout the process. This preliminary analysis helped inform both my questioning strategies from week to week and the approach I was taking (Bogdan & Biklen,1992). Near the end of the data-collection phase, I began looking for pools of meaning (Coffey & Atkinson, 1996) to help me better understand the data. Then, I used a combination of memoing (Strauss & Corbin, 1998) and coding (Coffey & Atkinson, 1996). Through these early efforts, and guided by the outline of the professional development framework, I was able to use a sorting method to organize the data (Creswell, 1994). Finally, each teacher's data were included in a cross-case analysis. This report represents an instrumental case study designed to illuminate an issue rather than highlight specific experiences (Stake & Mabry, 1995).

While initially not intended to determine strict cause-and-effect relationships, this research examined situational and attitudinal factors that affected the teachers' adoption of the strategies. Through this examination, my intention was to offer a plausible picture of what giving support to these teachers involved. The measures of success and growth were based on my interpretations of what occurred in these specific classrooms as supported by the various data collected. While this study cannot offer firm answers for developing professional development programs, it provides a grounded theory (Strauss & Corbin, 1998) about professional development—specifically what kinds of elements should work together in a professional development situation.

Limitations of This Study

As with any participant observation, the account here is undeniably biased. I developed relationships with the teachers during the four-month duration of the study that undoubtedly affected my interpretations. One notable bias along these lines was based on the fact that Therese was more inclined to improve her teaching from the outset, thereby setting a different tone in our work together.

While this research no doubt would have been different if I had been able to separate the "researcher" from the "professional developer," that was not a possibility. The findings and suggestions reported here present an image that could be viewed as "half empty" or as "half full." Because I was there and because I was a stakeholder, I chose to focus on the small amount of growth that was made rather than the improvements that undeniably were still needed in the end. The teachers were affected by my professional development effort—they reported it, the analysis of the videos show a small change, and analysis of the observations warrants the claim that changes were made. The questions then become if the changes were substantial enough to warrant the effort and if they will last beyond the end of this study. Those are questions that this study cannot answer.

A substantial hole in the data comes from the lack of a student voice in a project that focused on building learner-centered classrooms. There were no data collected on student performance or on student perception of the teaching style being used.

RESULTS AND DISCUSSION

The Professional Developer Role in the Evolved Framework

Professional developer as content expert. From my work with the two teachers and the discussions I had with the outside observers involved in my data collection, I came to understand more about the many aspects of the role of the professional developer. First, I found that in this situation, the professional developer needed to be a facilitator well versed in research literature as well as experienced in using these strategies in other classrooms. My ability to bring in stories of other classrooms as well as examples from the literature helped build my credibility with the teachers. For example, I was able to use stories from my own experience and from the literature as a basis for interview discussions. In one such instance, I pulled an observation I had witnessed from another classroom in a discussion of developing an understanding of student thinking. In our conversation, Therese had been talking about how she wanted to understand where the students were through their questions and answers rather than through using them to measure correctness. In order to move the conversation forward, I offered this anecdote:

Chandra: I saw in a class one time—they were using Chelsea and the teacher asked the student, "why does the supervisor need to check—to verify—this check before you can cash it?" And the student said, "because it might be stolen." And she was like, "no," and she went on to another person. And that person said, "Because it's in the manual." And she was like, "Right." And, they were answering two different questions.

Therese: Exactly, exactly ,exactly. I mean the kid did answer the question. That was a legitimate answer.

Chandra: And, he was actually thinking harder than the person who said,

Therese: Exactly, exactly, exactly.

Chandra: "The manual said this."

Therese: The whole purpose of the manual is to help you avoid cashing a check that might be stolen. [She giggles.]

Chandra: Stolen or. . .

Therese: You know, whatever. Forgery.

Chandra: I thought it was really cool because the kid had—cause there is nothing in the manual that says you need to get it verified because of this. He thought through it to the next step. But, the teacher was in a hurry and didn't stop and say, "Why would you say that?"

Therese: Yeah. Yeah. Yeah. [We return to discussing the article that started this conversation.]

Through other examples, I was able to explain particular approaches I was promoting. For instance, when I explained proximal goals to Evelyn, I was able to pull in concrete examples directly from the work of Bandura and Schunk (1981) who had explored proximal goals in a mathematics setting. Because Evelyn was a math teacher, I thought these examples would be relevant to her.

Professional developer as resource provider. My background also proved important as I recommended certain reading materials to the teachers. By carefully selecting the materials and asking the teachers to read particular items, I was able see changes beyond those gained through my other efforts. For instance, when the teachers read *Improving Classroom Questions* (Chuska, 1995), there were observable behavior changes in both of them. The most important of these changes was Evelyn's movement toward a guiding approach in her questioning. While Evelyn may have known the questioning strategies and ideas before she read the book, the book's ideas affected her behavior more than any other single intervention. The first class period after she had thoroughly examined the book, Evelyn was the least directive of all the days I observed her. She still maintained control over the students by releasing them to their computers one group at a time, but she also allowed students to solve problems that she had previously not allowed them to figure out:

Evelyn watched group two as they struggled to count money—they were just grabbing and dragging. She glanced over at group three for a moment and talked to team three about an answer they have typed. She glanced over at group one. Then back to group two—who finally finds the tally sheet and is suddenly more organized in their counting.

During this same class period, Evelyn overtly tied her change in teaching to the Chuska (1995) book by adopting an approach she had read in

the book. Rather than telling the students what to do or questioning them during the scenarios, she wrote down questions to discuss at the end of the period. This step dramatically reduced the number of interactions she had with the students and nearly eliminated the directive interactions that had plagued much of her approach. More importantly, this strategy tied the debriefing discussion more tightly to the work the students had done that day. Because of this, the debriefing was more focused as were the few interactions Evelyn had with her students. For instance, once during the scenario, Evelyn approached a team and had the following conversation:

Evelyn: Before you made the decision did you go to the manual?

Students: Yes.

Student: [Indicating herself and another student,] We said C. He said B.

Evelyn: What do you think you could have done?

Student: Could we have gone back to the manual? [The student seemed sincere in asking this question.]

Evelyn: Yes. You could have.

Evelyn: [Elaborating and mentioning once again that they were looking for details,] With 3 of you, if someone disagrees, you need to go back and see what everything said.

This was a far less directive interaction than I was used to seeing with Evelyn. She focused on helping the team understand the value of looking at details while supporting them in the process of becoming better at cooperative problem solving. In this way, she not only allowed students more ownership, but shifted their learning from being *doing* based to being *understanding* based. In earlier interactions of this kind, typically, she would have stopped the students when they indicated disagreement, and told them to go back and read the manual. In earlier scenarios, Evelyn likely would have told the students that they needed to go to the manual. As an example, in one earlier scenario, this was how she worked with students:

Evelyn: [Moving to computer #15,] What's going on in the scenario?

Student: Some of the checks are not signed.

Evelyn: So it was not endorsed—the word is endorsed. Did you look at the manual?

Student: [Inaudible.]

Evelyn: Go to your manual and see what it says. Then start turning over those checks.

Evelyn did not ask the students what choice they were thinking of or if they were even ready to move to the manual. Instead, she prescribed going to the manual. This took away any decision making from the students and emphasized the manual over the group process.

Professional developer as questioner. Next, as the professional developer, I needed to be a support person. This meant that I offered feedback, acted as a second pair of eyes, and helped the teacher find solutions to problems through reflection or brainstorming. Occasionally, it also meant that I owned the change process because the nature of the project required me to determine when to use different approaches.

In this research, my primary activity was simply promoting reflection. I did this through the questions that I asked in my interviews with the teachers. The questions maintained a focus on having the teachers explore what they did in their class that day. During the research effort, I moved from more general questions such as, "When your students are working with the CRI simulations, what sorts of things do you do? Why do you do these things?" to more specific questions such as, "How did you support metacognition in class today?" This straightforward approach impacted both teachers. They were better able to discuss their own work and move toward their goals at the end of the research than at the outset.

Evelyn, more than Therese, seemed to improve in her reflective skills. She gradually moved toward better and more specific answers about her teaching. By the end of our work together, Evelyn was even willing to consider changes she might make in her own teaching—something that had been totally absent from our early conversations. For example, in our first month together, when I asked Evelyn what she would most like to improve about her teaching, her answer shifted away from critically examining her own work:

What I would really like is some computers that work so every time I go in there I don't have to be adjusting

and changing and going through this. You know what I would like is a room with the computers where these kids go in and do what they have to do and no one else is going in and messing it up and every morning before you come I have to go to every computer and make sure everything is on. This morning when I went in, there were five computers that were knocked out again. And, it's very, very frustrating because here it is. I am teaching a first and second period. I have to kind of leave them [to go] back and forth . . . to make sure everything is on so that by the time you get here, the kids won't be idling.

By the end of my work with Evelyn, she had begun to reflect on her teaching and was able to talk about changes she had made as well as changes she wanted to make. For example, in the following interview excerpt, Evelyn reflected on how she would like to improve her teaching of the simulation:

Maybe some more training in some areas where I basically know the whole scenario. It's so hard to use the word *improve* when I have done it so many times. But, maybe some more directed questions. Maybe I can develop different type questioning based on what is in the scenario. I basically like kids acting out and stuff like that. . . . But, on the scenario itself, I basically know the whole scenario I've done it so many times—maybe writing some more what they need to do and maybe to work with them even more closely. If I had the time . . . to work with them as much as I would like to be able to see that the final product of their skit really comes out the way I want it to come out. So, maybe something like that.

While there were still numerous issues showing up in this reply about her perspective of her role as teacher and she was equating good teaching with knowing the scenario well, Evelyn also indicated an ability to improve the scenario by thinking about how she had taught the scenarios previously. This was a critical step in our work together.

Therese, more than Evelyn, seemed to probe deeper into her goals and her own understandings to improve her teaching. She commented on the role of reflection in our final interview, saying:

I mean the feedback has influenced [my teaching] because every time I do something I think in terms of whatever suggestion you gave me. It's not even a matter of suggestions—it's a matter of some questions that you asked me that somehow I incorporated and started thinking about: "Why?" and "What it is I really want to do?" So, it helps me keep on task.

For Therese, reflection combined with my feedback allowed an opportunity for her to start understanding how some of the things she did naturally led to particular outcomes she had not thought of. For example, when we began, she often could not answer questions about how she supported problem solving in the simulations. Yet, I repeatedly saw her doing things that promoted problem solving in different ways, such as asking students to generate their own guiding questions for the scenarios (an idea she got through our reflective sessions), promoting careful reading, and providing an inquiry structure that asked students to think about what they know and what they want to know at the beginning of each scenario.

Professional developer as supporter. While being able to support the teachers was necessary, acting as an advisor to the teachers was not. I found that the teachers trusted only their own experiences. For instance, one week in the middle of the study, I supported some students on the computers while Therese worked with others on a related activity. During our interview, I explained what had happened while I was working with the students and suggested where I thought the students were struggling the most. While Therese seemed to agree with the conclusions I had posited about the students' problems on the scenario, as evidenced by her willingness to have the entire class rework the scenario, it was not until Therese herself worked with the students that she was willing to treat those problems. In fact, during the second session of working on this scenario, Therese stopped her students to have a whole-class discussion of "changeover costs," which had been the concept the students were struggling with in the earlier attempt. In our interview that day, Therese indicated that she had trusted my opinion and realized there was a problem, but needed to see the problem with her own eyes in order to act on it. She commented:

Even though they didn't do well the first time, I didn't really get the opportunity to see why they didn't do well. So, this time, I could really see why because that

time was just a [bad] day altogether. But now I can see with my own two eyes where the stumbling block is, and with more preparation, I could get them on the road.

The single instance of more overt advising that did seem to work was Duffy's informal modeling of questioning techniques for Therese during his visit as an outside observer. While Therese never commented on that incident, Duffy and I both noted how quickly she adopted the same kinds of critical questions he had asked the students about the program. Therese further supported the notion of professional developer as modeler in our final interview when she stated that the thing I could have done that would have been more helpful would have been to show her what I wanted by modeling it for her. However, even with the professional developer as a model, the teacher still retains control over deciding what is appropriate for the students at a given moment.

My experience seemed to be significantly like that of Richardson (1992) in that the teachers showed more interest in topics that arose from their concerns than in those that I suggested. In fact, when I commented on readings, the conversation often stopped. Whereas, when they talked about the readings, their discussion grew. This reemphasized the need for me to act in a supportive role rather than an advisory one.

Professional development as developing understanding. The other primary foundation of the evolved framework is the notion that professional development is more than another way to provide tools for teachers. It seems that professional development is too often aimed at doing skills—that is, aimed at filling the teachers' toolboxes with many activities they can do in their classrooms. They can put students in groups, have students do research, and use manipulatives. However, little time is spent supporting teachers in developing an understanding about why to use these tools, how to use these tools, or how these tools will have an impact on student learning. This doing and understanding dichotomy also carried through to the classroom and affected the way the teachers taught. For a simple example of this, I turn to my first observation of Evelyn's math class. She was trying to explain addition of positive and negative integers to her students. She represented the negative numbers with filled-in circles and the positive numbers with empty circles drawn on the chalkboard. She placed these circles in rows over each other and crossed out the corresponding number of circles to leave two empty circles. She then told the students that this was called using "manipulatives" because it allowed them easily to see what they were doing. However, using manipulatives is generally understood to mean actually using objects that can be shifted around. While this point at first seems minor, it becomes an excellent illustration of the difference between doing and understanding. The teacher was providing a visual representation for marking out circles and counting what was left, however, she was not allowing the students to become physically involved in the math by using solid objects that they could move around to develop their own mathematical understanding. By using the board, Evelyn kept the numbers rather abstract. If she had developed an understanding of manipulatives, she would have realized that part of their value was in the students' actual handling of the tools to solve math problems.

In another example of the pervasiveness of doing, Evelyn asked her class to reflect at the end of one scenario. Typically, reflection is used to help push understanding further or to foster metacognition. However, as shown in the following excerpt from our conversation, Evelyn saw reflection as another doing activity—her only goals were memorization-level, and not the development of understanding. Following is Evelyn's discussion of goals in her "reflection" activity:

I am wanting to see whether the students actually remembered what happened last week and see what decisions they made based on what they remember. Also, to see, as I pointed out—in walking around [I noticed that] some people said that, "No. nothing happened." They know very well that something went wrong. We had this whole discussion based on the choice or the decision they made, but because they did not want to write, they decide, "No" and leave it there because if they answer "yes" then they have to explain. So, this taught me that I will rephrase my questions in the future so they will not give me that blank, "No."

This over-emphasis on doing and the associated need for understanding pushed my framework to focus more on reflection. By its very nature, reflection requires a development of understanding—particularly in this situation where I held a mirror up for the teacher and asked her about what she was doing and why. In fact, reflection became a foundation—ever present and always going a little further. Through this stronger emphasis, the teachers were able to examine innovations and approaches more critically. From this, the underlying hope is that if teachers are more critical in their classroom decisions, they will model more critical thinking and allow for more higher-order learning than if they are focused solely on doing.

Evolutions in the Pieces of the Framework

In addition to the findings about the role of the professional developer that came from this study, I also learned more about the framework itself. Through iterative testing in the field and reflection, I was able to develop a different understanding about the professional development framework itself.

Reflection. When I developed the original professional development framework, I envisioned proximal goals being at the center of my work with the teachers. After all, growth and change come through meeting those goals. However, in the enactment, reflection was the most important element of the work I did. Both teachers reported that they found the reflective questions to be valuable in helping them to stay on task and become better teachers. Further, the reflection seemed to provide a tool for examining beliefs. Therese was able to make her classroom approaches and plans more closely adhere to the beliefs she held about teaching and learning. Even when we first began working together, Therese had many beliefs about students learning by doing and an understanding that she could not transmit her knowledge to them. However, her classroom initially tended to be quite traditional—particularly when she used the simulation. By the end of my work with her, Therese was implementing more of the beliefs she held about learning, such as to "provide [the students] with some basic tools so they can go and investigate things on their own with some guidance." This particular goal was addressed, in part, by Therese's asking the students to generate their own questions to guide their work through the simulation.

Evelyn, on the other hand, was able to align dissonant beliefs with each other. For example, she believed that students learn from talking, writing, asking questions of each other, and being engaged in learning. Yet, she also believed that the teacher's job was to deliver knowledge to the students. For example, she said that students:

> Learn by their mistakes—by making a mistake and possibly, after they realize a mistake is made they can sit down and try to correct it on their own or ask for help to correct the mistake they have made.

This implied that students need a teacher to tell them how to fix their errors. Through reflection, she was able to move more toward her vision of good learning by beginning to create a new model of good teaching. She moved, in action, from being authoritative to being more understanding and tolerant. For example, early in the research, the outside observers referred to her as "harsh" (Kirkley) and "authoritative" (Yoshida). Evelyn would often say things that were quite critical to the students such as announcing to one team, "I want to tell you since I went around to every station . . . You did not check the money. Go back and check the money." This was a sharp contrast to the questioning she was doing by the end of the research.

Proximal goals. In the original conceptualization of this framework, proximal goals were to be used as motivational strategies to help move the participants from being teacher centered to being more learner centered. The initial concept would have involved working with each teacher to identify the areas where she needed to become more learner centered in the classroom. The likely implementation would have involved my developing the proximal goals with the teachers, or, more likely, for the teachers, and

giving these formulated goals to them almost as a doctor hands a patient a prescription. The goals were to be focused on the teachers' efforts, the distal goal being for the teachers to become learner-centered facilitators while they used the simulations.

During the study, it became apparent that this approach would be inappropriate for a number of reasons. First, it did not allow the teacher to own the change process (Richardson, 1992). The changes would have been the changes that I, as the professional developer, found appropriate. The teachers might or might not have found value in those changes and would have, at best, tried them because they wanted to help me, not because they intended to use the ideas once I left. Second, this process would have been too dependent on the professional developer. The teachers would not have learned how to generate proximal goals for themselves. Rather, I would have provided them with one more tool to adapt to their situation in whatever way they felt was appropriate—whether it was consistent with the ideas behind proximal goals or not. Finally, the process as originally outlined assumed that the teachers would buy into the idea of changing for the sake of changing. It required that they adopt my perspectives on how teaching should be. In short, the approach as initially proposed was not learner centered. Rather than modeling the environment that I wanted each teacher to create for her students, the initial plan required me to dictate how she should react and behave with her students.

Fortunately, through my interviews with the teachers, I identified these weaknesses in time to make some major changes in the approach so that the teachers could own the process. Rather than focus the proximal goals on changing the teachers, I found it effective to focus the teachers' attention on improving student learning. Once each teacher identified the areas where she wanted to see student improvement, we were able to generate proximal goals for getting there using reflective questions that led to the development of a framework for developing proximal goals.

Each teacher was introduced to the notion of proximal goals very differently. In my work with Therese, I initially took responsibility for developing the goals rather than helping her learn to develop them. This led her to depend on me to give her a list that she could customize. For example, I suggested, as a proximal goal, creating reflection questions that would be ready immediately when students finished their scenarios. This was to be a step toward the distal goal of getting the students more focused on the scenarios and on learning. Therese modified this proximal goal to have students generate their own questions about the scenario that guided their work on each scene and provided reflection opportunity at the end. This approach tied into Therese's overall views of learning and moved her toward the classroom she wanted. By the end of my work with her, she was generating proximal goals quite naturally by herself as she reflected on where her students were and where she wanted them to go. Therese often spoke of her work with the students in terms of the next goal they would work toward.

In my work with Evelyn, I found myself at the opposite extreme. Because Evelyn perceived herself as a good, experienced teacher, I felt that she would be very resistant to any ideas that I suggested for change. Therefore, I introduced proximal goals to her as an idea to try in her room. Without any guiding questions and only a few examples to work from, Evelyn developed and implemented some goals; however, they seemed to lack the specificity needed to be successful in providing the motivation and structure that they should have offered. For example, her initial proximal goal was to improve the students' writing process. This was a huge goal that would not be easy to achieve. Further, she never fully adopted the proximal goals as part of her planning process. If she did not have extra time, she did not generate goals, but planned the classes as she always had, whereas, Therese used the goals as a framework for her regular classroom planning.

As stated earlier, by the end of the research, I had developed a question framework for this process. The questions stepped the teachers through a planning process by asking them to identify their distal goal for their students, examine why students were not yet achieving that goal, break the goal into proximal goals,

and examine how the teachers could support the students in reaching those goals. I piloted the framework with three members of the collegial group during a group meeting. Based on the response in the collegial group and from Therese and Evelyn individually, it seems that these questions should have served as the basis for the development of proximal goals. Even in our brief work with these questions in one collegial group meeting, it was apparent that these questions helped the teachers focus and forced them to think. By shifting proximal goals in this way, there is a focus on what the students need to improve and all of the strategies that a teacher can use to support this improvement.

Overall, this work was an important shift in the use of proximal goals. Rather than using them for learning, as they are commonly discussed in the literature, the proximal goals became tools for teaching. Therese, in particular, was starting to guide her efforts through the setting and evaluation of proximal goals. For instance, in discussing metacognition during the simulation, Therese said, "I need to set up some proximal goals so that I can get there. Because . . . we're not in that area yet."

Resources. In my work with these two teachers, I found my initial inclination to provide a small library of materials for the teachers to be flawed. It seemed that providing a resource library—in this case, an organized binder of materials chosen to support teachers in learning about the kinds of things learner-centered facilitators do—actually prevented the teachers from using the resources because they were overwhelmed by them. Through the discussions I had with the teachers and my observations of what it took to promote the reading of any professional development materials, my understanding of how they should be used evolved. First, the materials should be provided on an as-needed basis, but as immediately as possible. If a teacher were struggling with collaboration, for instance, to be able to pull out an article with good ideas and provide it on the spot would have greatly increased the chances of the article being read. Because it had immediate relevancy, it probably would not have been one of the many articles being skimmed over.

Next, I found that, because of time constraints, teachers often skimmed the articles rather than reading them carefully. Therefore, the articles chosen for professional development should be very clear and include structures that help guide skimming, such as numbered lists and bullet points. The point of the article should be to help the teacher, not hold her captive.

Finally, through a combination of the resources and collegial group, I learned that teachers have the power to influence each other. If one teacher reads an article or book and finds it exciting, she can help motivate others to read. For longer-term efforts, this effect could be very important.

Collegial group. The collegial group in this research proved to be valuable in two ways. First, it provided a forum for sharing ideas and helping each other. When we began our work, the teachers did not know anything about one another's simulations. By the time we ended, the teachers knew a little about each other's simulations, but, more importantly, they realized that they were all struggling with the same problems. Through the group interactions, the teachers were able to brainstorm new ways of dealing with problems as well as learn from each other's experiences. For instance, the teachers discussed having only some of the students work on the computers at one time while the others did other activities. Through the interactions, the teachers were able to hear different perspectives, both a good experience and a bad one, to help them in deciding the best approach for their own use.

Second, the collegial group helped equalize the teachers. In the first meeting, Evelyn took charge—and, it seemed that this was a fairly typical experience. However, through the sharing of different experiences and the opportunity to discuss issues in an informal setting, the teachers quickly shifted their interactions with each other. By the last meeting, even Evelyn was learning from Mr. Crane, a first-year teacher, as he discussed why it was important for his students to learn about genetics. Everyone could be the learner and everyone could be the expert.

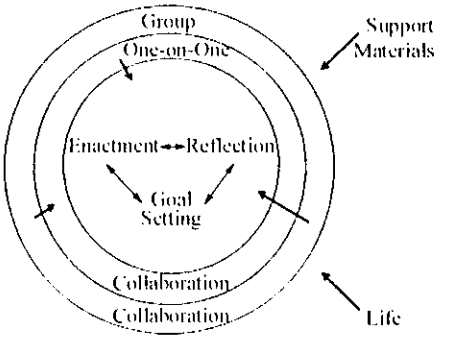
One-on-one interactions. Framing my work with the teachers were the one-on-one interactions I

had with them. Through these interactions, I was able to build trust, promote reflection, suggest strategies, and offer opinions. Both teachers felt that this one-on-one relationship was vital to keeping them "on track." In their reflections they noted that the benefit of having me there was that it forced them to keep progressing in their work and to keep working with the simulations and the teaching styles they were cultivating because they knew I would be there and expect that. While the interactions I had with the teachers were more intense than might reasonably be expected in practice, it seems that the positive influence of the interactions makes them worth considering further. It may be that a portion of the one-on-one interaction in this framework could occur using a peer coaching model. However, because interactions were sometimes successful because of the expertise I could offer as a professional developer, especially the expertise of outside experience, it seems that some of the one-on-one work with a professional developer is also important. My knowledge of how the simulations worked in other classrooms and my knowledge of the literature were both beneficial to the professional development effort at certain points. For example, when Therese expressed an interest in promoting more thinking through a writing assignment to accompany the simulation, I was able to tell her about some similar assignments I had seen in other classrooms and how they had worked. This allowed Therese the opportunity to explore her idea more thoroughly before implementing it.

The Evolved Framework of Professional Development

As indicated already in this discussion, the goal of this research was to develop an understanding of what it takes to support teachers in becoming more learner centered—particularly in the area of supporting critical thinking. To this end, the framework that I began with evolved constantly based on the data collected. The outcome was a more holistic model with more tightly interwoven parts than the original model suggested. Perhaps not surprisingly, it is also more learner centered than the original model. After all, how could I expect these teachers to change in a way that was dramatically different from the way I was supporting them?

Figure 2 ☐ Evolution of Professional Development Framework.



The heart of the framework. The evolved framework (Figure 2) was centered around reflection, especially as it was influenced and promoted by enactment and the implementation of proximal goals. In this model, the teacher and professional developer first needed to build a common set of experiences so that the reflection on enactment—that is, what the teacher just experienced in her class—could occur. Then, reflection provided a way for the teachers to see how the pieces of what they did worked together and how they were helping their students meet the goals they had set for them.

Reflection must also be refined. In this study, this happened through repetition of reflective questions over time, using questions that evolved to be more specific and in depth. By using this approach, I found it natural to move the teachers to become more thoughtful about their practice.

Proximal goals, as implemented in this study, provided a motivational force for the teachers and provided a foundation for reflection. They also offered a structure for change previously absent by allowing the teachers to focus on attending to and promoting student learning. The goals allowed each teacher to focus on her goals for her students and how she could move

them to those goals. Through the reflective part of the model, then, the proximal goals were constantly examined and refined. This interplay allowed the goals to serve as change agents as they pushed each teacher to work constantly to improve her students' learning experiences and evaluate her effects.

Finally, enactment completes the triad of essential building blocks for the model. It was through the enactment that change occurred. In this study I found that reflection on the enactment highlighted problems and led to the development of proximal goals. All three strategies depended on each other. In fact, for Therese the three pieces could no longer be separated by the end of my work at Thacker Middle School. They had become interdependent. Therese could no longer reflect on her classroom without generating a proximal goal that she would enact to address a situation that had arisen. She could no longer plan a class or teach without implementing something that she talked about in her reflection. In one simple example, in one of our final discussions, she mentioned that teamwork was one of her biggest frustrations. In her next class period with the computers, she actively provided a strategy to the students of making triangles with their three chairs in order to make it easier to work in teams. Her reflection, enactment, and goals were all intertwined.

The context for the framework. The two outer circles of the model represent the context within which the change took place. First, one-on-one collaboration provided an opportunity for deep reflection to take place. As pointed out by both teachers, if I had not been there, they would not have kept going in their efforts. In fact, Evelyn commented that she would have reverted back to her old way of teaching. Having an outsider present seemed to challenge the teachers to hold a mirror up to their teaching and describe what they saw to someone else. It was during these one-on-one interactions that the teachers seemed to grow the most and seemed to work through some of the problems they were seeing. The one-on-one interaction took place in a safe environment where I was a listener, not an adviser. Based on my experience, this one-on-one relationship needed to include both debriefing sessions and classroom observations. This helped build a well-rounded image of what was happening in the classroom.

The second context within which the change occured was a peer group. In this research, the peer group served several purposes. First, it allowed teachers to share problems, stories, and experiences with each other. By doing this, the teachers' initial feelings of isolation were eased. The collegial group also allowed each teacher to be a follower and each teacher to be a leader. Even Mr. Crane, one of the first-year teachers who had been very quiet in most meetings, came to life when he was asked a question that allowed him to share his expertise with the group. Finally, the peer groups allowed for learning—from each other and from the staff developer.

These contexts are, in many ways, the communications tools of the heart of the model. Without the one-on-one interactions and the group interactions, there would likely be no chance for reflection and little chance for exploring new ideas.

Influences on the framework. Finally, there were outside influences that needed to be considered as part of this overall professional development effort. The first were the learning resources that were brought into the system. In this case, these resources were mostly print-based. I chose articles and books that were directly relevant to supporting teachers in reaching the goals involved with becoming more learner centered. As already described, these resources had an impact on the teachers when they did use them. For instance, the only resource I specifically asked the teachers to read during this research was *Improving Classroom Questions* (Chuska, 1995). While only Therese read the book when I initially asked the teachers to read it, her discussion of the book in our collegial group meeting inspired the others to at least glance through it and find useful pieces. More importantly, it led to visible changes in both Evelyn and Therese's classroom behaviors.

The other influencing factor on the framework has simply been deemed "life." It included all of the unpredictable factors that had an impact on the professional development effort.

For instance, early in this research there were significant portions of class time that were lost to computer problems, and throughout the research there were numerous unexpected schedule changes that affected whether the classes met at all. All of these factors affected the professional development and need to be considered. However, the flexibility of this framework allowed the effort to move forward even with unexpected problems.

AREAS FOR FURTHER RESEARCH

As with any research effort, this one raised a number of compelling questions worth further exploration. First, there were a number of professional development issues raised in this research. One of the most compelling areas for further research is in the area of using proximal goals as change agents and teaching tools. My implementation of proximal goals differed dramatically from the original concept. The goals focused on the students rather than the teachers, becoming an organizing framework for the teacher to use to move students further rather than a guide to follow to randomly change teaching approaches. Do they have value in helping to improve teachers' classroom approaches and do they offer a framework for change by themselves? This question needs to be explored. In addition, there is still much to be learned about ongoing professional development and supporting teachers in becoming more learner centered.

There are also serious questions to be raised about how to provide professional development that leads to meaningful change. If this framework is moving in that direction, what are the implications? How can we scale-up an effort of this sort—one that is time intensive as well as resource intensive? Is this kind of effort feasible in a larger context? Undoubtedly, there would have to be changes made to this framework considering that one researcher was able to support two teachers in making only minor changes in four months. In order to scale-up the effort, using the collegial group more and providing a peer-coaching model might be feasible options to promote sustainability and scalability. Once the professional developer has supported a group of teachers in becoming more reflective and more learner centered, that group could help support their colleagues. In this study, there seemed to be no clear point at which a professional developer would not be needed in some way, but with a peer-coaching model, some of the professional developer support role might be done online rather than exclusively in the classroom. However, as pointed out by Blumenfeld et al. (1994), professional development models that strive to influence practice are monetarily and resource intensive. Based on this research, this seems to be an inescapable truth. There were no apparent shortcuts—every aspect of the framework seemed a necessary component and sustainable change necessarily takes time (e.g., Mevarech, 1995).

Another area for further consideration is how to use this framework in other settings where learner-centered principles are to be enacted. This framework is open-ended enough potentially to be useful in a variety of settings, not just those using computer-based, workplace simulations. In fact, in this case, the software actually may have harmed the effort to develop the learner-centered, thinking-oriented classroom. For example, in Therese's class students asked questions that could have led to more learning but were stopped by a lack of the critical information necessary to pursue learning. One instance involved students wanting to know which grade of paper had the highest profit margin for the company. They were unable to determine this because the only information provided by the simulation was the selling price for the paper without its production cost. However, the software did provide relief from the teachers' "regular" classrooms and, in fact, may have promoted a more adventurous spirit in the classroom. Therefore, more research is needed on the transferability of the framework to other situations.

Finally, there were questions surrounding the appropriate use of technology. The teachers struggled to fit the simulations into an already overcrowded curriculum. There was little attempt to really integrate the programs and there were a number of technology problems that interfered with the learning process. How

can ongoing professional development help support a more integrated approach to software integration that is critical to many kinds of learner-centered environments? If the teachers see the software as an add-on, will they also see the strategies used in this framework as being add-ons? If so, there will be no long-term change in teachers' daily classroom. One key may be to offer longer or more frequent exposure to the professional developer.

There is, undoubtedly, more research needed on this professional development framework. Like other frameworks and models that propose changing the way we think about professional development, and, in fact, the teaching profession (e.g., Blumenfeld et al, 1994; Stein et al., 1999), this one is time intensive and would be quite expensive to carry out in a large scale effort. However, if the results of the effort are the development of classrooms that focus on learning and teachers who are reflective professionals, the cost will be worthwhile. □

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