II. Background and Research

Introduction

The literature concerning teacher adoption of innovations and professional development paints a picture of a culture that is highly resistant to change. This is especially true if the change involves more than simple classroom management strategies (Richardson, 1990). Because of the culture of school – both internal and external – change is difficult at best (e.g., Guskey, 1986; Guskey, 1989; Richardson, 1990). Often, even in successful implementations of innovations, the teachers who appear to be adapting their classrooms for the product walk away from their efforts after only a couple years of effort (Mevarech, 1995). In fact, the literature tells us more about teachers failing to adopt the new ways than about successful approaches to professional development (Richardson, 1990).

In response to this bleak picture of traditional forms of professional development and the movement toward more constructivist learning environments, there have recently been a number of more successful models to professional development (e.g., Ball, 1990; Blumenfeld, Krajcik, Marx, & Soloway, 1994; Hannay, Bissegger, Haston, & Mahony, 1994; Richardson, 1992). These models tend to differ in many ways from traditional professional development or teacher training

efforts. For instance, they tend to be more longitudinal, avoiding the one-shot workshop approach. They also tend to include development of reflective skills as an important development point. We are seeing a shift from merely teaching teachers to "do" something to cultivating understanding, bridging gaps between teachers' beliefs and practices, and developing peer groups within which teachers can share and learn. So, far these kinds of efforts look promising as catalysts in the teacher change process.

It is this promising new path for professional development that the work described in this study grew from. In order to become a professional developer for the purposes of this study, I drew from a variety of sources. Literature on professional development and teacher change guided my vision of how it should be done, while the past experience of our team working with CRI schools helped inform my enactment. Further, a vision of what schools could be and what CRI intended to have their classrooms become was the underlying goal for the framework that was created and the professional development effort that was undertaken.

Foundation: What Schools Can Be

The desired outcome of the professional development activities being considered in this research involved the development of learner-centered classrooms.

While learner-centered involves many things, five basic premises underlie the learner-centered model (McCombs & Whisler, 1997):

- Learners are distinct and unique
- For optimal learning to occur, all of the learners' differences (cognitive and affective) must be considered.
- Learning is constructive. Learning is optimized when the learner is actively engaged in creating an understanding by connecting what's being learned to prior knowledge.
- Learning occurs best in a comfortable place where the learner is appreciated and respected.
- Learning is a natural process – people are, by nature, curious.

In addition to these premises, I also relied on the American Psychological Association's list of "The 14 Learner-Centered Psychological Principles" that address issues related to cognitive and metacognitive factors, motivational and affective factors, developmental and social factors, and individual differences factors (Learner-Centered Principles Work Group, 1997). These factors outline a vision of education that promotes a "do learn" attitude (McCombs & Whisler, 1997). These environments "respect and accommodate student diversity by assuming that learning and motivation are natural and that students can be trusted to guide their own learning process; they do not have to be sorted by others into presumed categories of ability" (McCombs & Whisler, 1997, p. 19). These are not "can learn" situations where it is assumed that learning is possible, these are "do learn" environments where the potential for learning is enacted (McCombs & Whisler, 1997).

It is these premises and factors that guided the direction of the research. The goal of the proposed change was to promote teachers movement toward becoming learner-centered in their classrooms as they used the CRI simulations. As pointed out by John Snyder:

> The most important contribution we as educators can make to the well-being of children is to enable them to deal effectively with their universe.…This is not, of course, a trivial task It combines a number of concerns ranging from teaching basic skills to readying students for the marketplace. In essence, it combines giving them the tools to analyze a situation to make an appropriate response, the self-confidence to use those tools, and the pride and motivation to use them with excellence. (Quoted in National Commission on Teaching & America's Future, 1996)

What does "learner-centered" mean in this research?

In planning for this research, it was necessary to focus on certain aspects of the learner-centered classroom that seemed most appropriate and most important to the use of these simulations. Based on our previous experiences with the simulations (Hawley & Duffy, 1997; Hawley & Duffy, 1998b), the literature (e.g., McCombs & Whisler, 1997), and CRI's goals (Classroom, 1998; Classroom, 1999), I decided to focus primarily on supporting the development of coaching skills for promoting critical thinking. This focused my efforts on the "Cognitive and Metacognitive Factors" as well as "Motivational and Affective Factors" (Learner-Centered

Principles Work Group, 1997). Specifically, I focused on the following framework items:

3. Construction of knowledge
4. Strategic thinking
5. Thinking about thinking
7. Motivational and emotional influences on learning
8. Intrinsic motivation to learn
9. Effects of motivation on effort

(Learner-Centered Principles Work Group, 1997)

With this set of factors as my emphasis, I explored the CRI simulations to understand how they could help support the teachers in this professional development effort.

The simulations offered certain inherent supports for critical thinking. The idea that learning should take place within a sufficiently complex authentic problem is covered through the structuring of the simulations. All learning occurs in the context of a computer-based job with the students solving problems typical to those of the real work environment. For instance, the students may become a hotel manager, bank teller, or medical assistant in the computer-based environment. The simulations also provide materials that replicate real-world sources such as dictionaries, employee manuals, and primary sources such as letters and telephone calls. The simulations also have collaboration built into their system. Teachers readily embrace the idea of having the students work in teams to solve the problems and students readily discuss what is going on in the problem with each other and

with their teachers. These aspects certainly promote an environment in which critical thinking can occur. Further, they support the development of learner-centered classrooms as they address a number of principles such as learner-centered principle number 1 – allowing students to intentionally develop complex meaning from information and experience – and principle 4 – promoting the development of thinking and reasoning strategies (Learner-Centered Principles Work Group, 1997).

With all of those features built into the simulations, I could focus more on teacher skills and understanding than on the activity. Specifically, I was interested in helping the teachers develop questioning and other coaching skills, supporting reflection both in the teachers and in the students, and creating a critical thinking environment with an opportunity for students to become responsible for their own learning.

Coaching in Support of Critical Thinking

Coaching to support critical thinking as the focus of this research includes widespread use of modeling and questioning as well as scaffolding to help students learn how to learn and to become aware of their cognitive processes as well as learning the content. This development in the students may be a critical factor for learning (Learner-Centered Principles Work Group, 1997). Further, the classroom

should become inquiry-based rather than relying on an information transmission model. As Brooks and Brooks (1993) pointed out, an inquiry-based model shifts from a curriculum presented as pieces of a whole to one that is offered as a whole with student learning centered on the big concepts rather than on basic skills. Further, in moving from the information transmitter to the coach, the teacher begins to develop an awareness of students' conceptions.

Conceptually, there are many implications for the teaching and learning environment in this shift to a more learner-centered, inquiry-based classroom. The traditional classroom does not account for various interpretations of reality. In fact, the traditional classroom is based on a model in which the teacher is the provider of information (Brooks & Brooks, 1993). Becoming learner-centered requires a fundamental shift in this traditional classroom model. As Lebow (quoted in Savery & Duffy, 1995, p. 137) points out:

> "...traditional educational technology values of replicability, reliability, communication, and control (Heinich, 1984) contrast sharply with the seven primary constructivist values of collaboration, personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism."

In practice, there are also a variety of shifts to be made. For instance, the learner-centered classroom may benefit greatly from a constructivist teacher at its heart. The constructivist teacher asks probing questions and focuses on the

development of cognitive skills (Brooks & Brooks, 1993) and is concerned with the way the students use those (Learner Centered Principles Work Group, 1997). Needless to say, the teacher would not focus on recall tests or worksheet activities, rather, she would provide ill-structured problems and other inquiry opportunities. According to Brooks and Brooks (1995), constructivist teachers (coaches) exhibit the following kinds of attributes. Teachers who are constructivist:

- encourage students to take responsibility for their own learning
- use raw data, primary sources, manipulatives, and other interactive materials
- use cognitive terminology
- allow students to drive lessons, shift instructional strategies, and alter the content of what they are learning
- ask the students about their understandings of concepts before offering their own understandings
- encourage students to engage in dialogue with each other and with the teacher
- ask open-ended questions that push the students' thinking and encourage them to ask each other these kinds of questions
- seek elaboration of student responses
- engage students in situations that might cause dissonance in the students' hypotheses and then encourage discussion
- nurture students' natural curiosity through a cycle of discovery learning, concept introduction, and concept application (pp. 103-117)

Savery and Duffy (Savery & Duffy, 1995) offer a slightly different view of the teacher's role. They assert that teachers should anchor all learning around an authentic task or problem with all the complexity that problem would have in a non-

instructional setting. In this view, the teacher should support the learner in developing ownership in that task or problem and in developing ownership in the process used to solve the problem, support and challenge the learner's thinking, encourage testing alternative hypotheses, and provide opportunities for reflection.

Further, it has been asserted that teachers concerned with promoting critical thinking should be positive and caring and believe that their students can learn (Wehlage & Rutter, 1986). Further, it may be helpful for teachers to be familiar with research and theory about learning and teaching when they choose to focus on critical thinking in their classroom. This is partially because of the value of modeling approaches for the students to use (Costa, 1984). The teachers should be motivators and, as the title *learner-centered* implies, need to focus on the students taking control of their own learning (Wehlage & Rutter, 1986). Borko and Putnam (1995) push the idea of the teacher needing theoretical knowledge a step further, asserting that the teacher needs to have general pedagogical knowledge, content knowledge, and knowledge of teaching the particular pedagogy.

According to Sternberg (1987), there are certain attitudes that often doom efforts at developing critical thinking skills:

1. The teacher maintains the position that the teacher is teacher and student is student.
2. Teacher believes that critical thinking in only the students' job.

3. The teacher buys into the fallacy that there is a single best program for teaching these skills.
4. The teacher cannot let go of the idea that everything is black & white.
5. A belief that getting the right answer is most important.
6. Believing that class discussion should be outcomes based
7. The teacher applies mastery learning to the situation when continuous improvement is the only appropriate measure.
8. A firm belief in the idea that the teacher must *teach* critical thinking.

These attitudes are mostly from the traditional approach to school. By moving away from traditional kinds of classroom teaching, we also potentially move away from many of these situations. Further, in the new classrooms, motivation presumably would be kept high and learning would be the central goal instead of teaching.

Coaching Through Questions

To a large extent, questioning is at the heart of the learner-centered classroom this research hoped to develop. Savery and Duffy (1995) asserted,

> The most critical teaching activity is in the questions the teacher asks the learner in that consulting and coaching activity. It is essential that the teacher *value as well as challenge* the learner's thinking. The teacher must not take over the thinking for the learner by telling the learner what to do or how to think, but rather teaching should be done by inquiring at the "leading edge" of the learner's thinking. (p. 139) [emphasis in the original]

The importance of questions is multifold. First, it opens a dialogue allowing for social negotiations to occur. These social negotiations are a fundamental instrument

of learning (Learner-Centered Principles Work Group, 1997; Savery & Duffy, 1995). Second, questioning conveys to the student that their opinions and thinking really do matter and are valuable to the teacher (Chuska, 1995). In addition to building confidence, this helps maintain the intrinsic motivation that is critical to learning as well as the relationship between the student and teacher the learner-centered classroom strives to develop (McCombs & Whisler, 1997).

Third, by asking questions, the teacher may be able to learn where the student is in his or her thinking. She may be able to identify problem areas and assumptions and, through further questioning, help her students realize errors in their initial conceptions. Brooks and Brooks (1993) make an important point on this topic by arguing that, too often, students are lazy in their assessment of the quality of their thought. They seem to expect the teacher to comment on each suggestion's quality. By asking questions of the students and expecting them to ask questions of each other, teachers may promote student metacognition as well as raising their overall quality of thinking. This is important because, "Some people will undoubtedly do more thinking than others...but it is desirable that the rest should at least do enough thinking to decide for themselves whether the special thinkers make sense or not" (DeBono, 1978, p. 18).

Questioning is a tricky undertaking. The teacher can lead a conversation or kill it with questions (Wassermann, 1987). Chuska (1995) proposed that the best way to become a successful questioner is by planning the questions to ask. He also suggested that the questions should be revised and evaluated regularly. As Sternberg (1987) pointed out, one of the ways to fail at teaching critical thinking is to assume that the student is the only one who needs to be thinking critically, it is vital for the teacher to also be a critical and reflective teacher. Of course, planning questions and thinking critically will not guarantee thoughtful conversations, however, it increases the likelihood of success.

The kinds of questions teachers should ask in the simulation situation are not unlike those in any problem-solving setting. Chuska's four conditions for promoting participation and higher order thinking (1995) provide one useful vantage point for considering questioning in the simulation classrooms. First, Chuska argues that questions must provide the student with something to think about – a dilemma, an uncertainty, or a paradox. In my work at one high school, the teacher was able to engage her students in spirited discussions by posing dilemmas. For instance, in *The Parkside Hotel*, the students had to decide whether or not to let the police use the hotel for a stakeout. Her students eagerly jumped into this discussion pointing out the

dilemma between being helpful to the police and conveying a questionable public image to the customers.

Next, the questions should use the students' views of the world as a vantagepoint. For instance, in another class, the teacher was able to lead heated discussions about discrimination when she talked about tattoos and smoking instead of race issues.

Chuska's third condition argued that the questions should promote a variety of ways of thinking, such as summarizing, interpreting, and comparing. In one class, the teacher was able to discern that her students were not paying enough attention to their work by simply asking them to summarize what they had done the day before. This was a valuable approach given that the students appeared to be doing a wonderful job on their assignments as the teacher watched them work. However, it was through questioning that she was able to discern that they were not being thoughtful in their work.

Chuska's fourth condition proposed that the students should be given a reason to think about the material with which they are working. In the context of the simulations, there are many potential reasons for what the students are doing. In one class I worked with, a lack of purpose drove the students to dislike the simulation.

They saw no point in their activities and the teacher was unable to share her goals with them.

Barriers to Development of Learner-Centered Classrooms

As a nation, the United States has a long way to go to meet the teaching and learning goals set forth by the learner-centered principles. For instance, “The Condition of Education 1997” (National Center for Educational Statistics, 1997) tells us that in the 1994-95 school year only 59% of the teachers surveyed used problems that had multiple solutions in the average school week. Further, only 59% of the teachers surveyed presented students with problems that had more than one way to be worked. Sixty-three percent of the teachers reported that they regularly asked their students to tie what they learn into the real world. While these numbers indicate that half of our students are encouraged to engage in thinking activities, it also reports that most of our classrooms still depend on the didactic environment. In fact, 98% of the teachers reported that they instruct their class and 90% of the teachers asked students to respond (orally) to questions testing recall at least once a week. While it is true that even in the learner-centered classroom there is likely to be some didactic instruction, it is apparent from these data that many teachers are not using critical thinking approaches in their learning environments.

This is not to single out teachers as the ones to blame for the lack of learner-centeredness. The situation is far more complex than that. For example, only 14% of teachers reported that that they participate in making most of the "important educational decisions" in their schools (National Center for Educational Statistics, 1997). Further, only 37% of all teachers felt that they had the resources needed to do their jobs. It is hard to expect teachers to adopt learner-centered practices when they feel they have little control over their environments.

There are also paradigms that tightly control aspects of our perceptions of students. For instance, one perception important to this study asserts that students must master certain basic skills before moving to higher-level thinking. Because of this perception at-risk students are often never exposed to higher-order thinking in school (Levine, 1988). This holds the students back, creating an even larger gap between the at-risk students and their peers. This almost certainly negatively affects their intrinsic motivation, and potentially creates a separate class of citizens who are unprepared to succeed in the world of work.

The fallacy of this misconception is shown through research. In one research effort, for instance, low achieving students were exposed to complex, open-ended problems as part of a physical education component in a summer camp (McBride & Bonnette, 1995). The researchers were testing the hypothesis set forth by Ennis that

"as students begin to associate thinking skills with activities in which they are successful they may be more likely to perceive the skills' relevance to other academic classes." (Ennis as quoted in McBride and Bonnette, 1995, p. 373). As will be discussed later in this chapter, there is a strong correlation between a learner's efficacy and their predisposition to try new things. McBride and Bonnette found an area where the students could be successful and included complex problem solving in the activities. They found that the students did experience a measurable increase in their reasoning skills during the camp and that they increased significantly over the reasoning scores of the control group. Further, in interviews with the participants, approximately 35% of their responses about the tasks centered on problem solving and evaluative activities. This research stands as one positive example that at-risk students can become problem solvers and can develop critical thinking skills.

Summary

Creating the learner-centered environment is vital for several reasons. First, there is a public request for these kinds of environments in the form of government and private educational evaluations and reports over the past two decades (e.g., Wingspread Group on Higher Education, 1993; National Commission on Teaching & America's Future, 1996; Learner-Centered Principles Work Group, 1997). Next

there is strong evidence in research on teaching and learning that suggests that creating learner-centered environments is not only a reasonable idea, but perhaps the best route to ensure learning – not just for our children, but for everyone throughout their lives (Learner-Centered Principles Work Group, 1997). Finally, it is vital because too many students are leaving school early or simply unprepared (e.g., U. S. Department of Labor, 1991). Attention needs to be paid to finding ways to make school matter more and to make schools safe places for developing ideas and critical thinking skills. These are two of the promises of learner-centered classrooms (McCombs & Whisler, 1997).

The benefits of creating critical thinking classrooms are well-documented. There is evidence that even positive behavioral changes, such as more listening to others and less giggling and whispering in classrooms when teachers deliberately attempted to teach thinking skills (DeBono, 1978). Further, thinking became a form of expression rather than simply being used to support or defend a point of view; more thinking modes beyond critical thinking began to be used; students took responsibility for learning; and students exhibited more willingness to consider new subjects as well as more confidence (DeBono, 1978).

Experience: Current CRI Training Effectiveness

A team of researchers from Indiana University (IU) has spent four years engaged in a major research effort examining teaching and learning issues related to the use of the CRI simulations including, assessment, school-to-work, and problem solving issues. As part of that research, the IU team has devoted a considerable amount of time to exploring the effectiveness of the teacher training, the role of the teacher in the classroom, and teachers' understanding of CRI's goal of developing facilitators. This portion of the research has focused only on a few schools and has been limited only to those schools using the traditional CRI training model (Hawley & Duffy, 1997; Hawley & Duffy, 1998b).

One thing we have learned during four years of work with the CRI simulations is that teacher change in this environment mirrors the findings of other teacher adoption research: change is very slow and very hard to promote (e.g. Dwyer, Ringstaff, & Sandholtz, 1991; Guskey, 1986; Mevarech, 1995; Richardson, 1990). The results of the professional development efforts, as gauged by teacher behavior in the classroom, have proven to be less successful than we initially anticipated. Teachers who used the simulations in their classrooms for at least one year reported that they generally saw their job as walking around and answering questions if necessary rather than taking a proactive approach to supporting problem

solving as students worked on the computers (Center for Innovation in Assessment, 1998). In fact, of 31 suggestions for supporting students while they use the simulations offered by one group of teachers, only 14 actually dealt with facilitative activities such as asking questions and modeling the problem-solving behaviors the students need to learn. Of those same 31 suggestions, 13 specifically said to let the students work and interact only if the students are "stuck" (Center for Innovation in Assessment, 1998). From the learner-centered, inquiry-oriented perspective, the teachers should be proactive in approaching the teams to determine their levels of understanding and to push them to think a little harder, a little more clearly, or in a reflective way. That is, the teachers would see themselves playing an active role in supporting inquiry.

The IU team's analysis of classroom practice confirmed the teachers' expressed beliefs: teachers approached each group only 1.23 instructionally relevant times per scenario for a median length of 23 seconds per interaction. We also observed that students request help 1.23 times per scenario[1]. When these

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1 Interactions were considered instructionally relevant only when they dealt with the learning associated with the scenario. This means that disciplinary interactions and those interactions that involved returning homework, etc., were not counted. Interactions were divided into two groups – those that the teacher initiated and those that the students initiated. A student-initiated interaction was one in which the students requested attention from the teacher by raising their hand or calling for him or her. Those that were teacher-initiated involved the teacher approaching a group to begin a dialogue about the team's work.

instructionally relevant interactions are combined, in an average scenario of 24 minutes and 22 seconds, the teachers averaged just under one minute (57 seconds) with each team. Even with a class of 30 divided into teams of three, the teacher spent a total of only nine minutes and 26 seconds working with any students in instructionally relevant ways.

Based on our analysis of these classrooms, we identified four basic teaching strategies:

- *Guiding* behavior indicated that the teacher was pushing the student cognitively. She would be likely to ask questions that would require the learner to think more deeply about the problem being solved or to tie the computer-based learning into real life. This kind of behavior demonstrated that the teacher was interested in the students' thinking and sought to push that thinking forward.
- *Directing* teachers were concerned with helping the students make it through the simulation in an efficient manner and making as few mistakes as possible. The teacher believed that the students would benefit most from having any questions answered in as efficient a manner as possible so that the students could return to their work. These interactions tended to be more task oriented than other kinds of interactions and tended to be more of the "right" versus "wrong" approach than the guiding interactions.
- *Observing* behaviors involved the teachers simply observing the students working. This may have been a reflection of the idea that students learn best if they are allowed to try things out for themselves. It may also indicate that a teacher is gathering information about the students' thinking in order to follow-up with a guiding interaction.
- *Other* designated interactions that were either disciplinary or otherwise not related to *Chelsea Bank* activities. For instance, teachers sometimes passed out papers, discuss other assignments or

> prepared students for their next activity while they worked on the simulation. (Center for Innovation in Assessment, 1998)

In our work with these cases, all of teachers tended to favor one of the four strategies above each of the 95 interactions observed. We classified 31 *other* interactions that we deemed to be instructionally irrelevant. Of the 64 instructionally relevant interactions that remained, only 26 were *guiding*. To put this in perspective, there were fewer *guiding* interactions than instructionally irrelevant interactions – in fact, only 27% of all interactions were guiding and 32% were instructionally irrelevant (Center for Innovation in Assessment, 1998).

The findings of this research reflect a combination of factors at work. What was learned from this work was that teachers were not implementing the guiding approach to teaching that was intended, an approach the research team saw as being desirable for developing independent thinking skills in students. Being a guide requires a variety of skills – questioning, modeling, scaffolding, etc. All of these skills work together to create an environment centered on individual learners or groups of learners. A guiding teacher's primary concern is getting the students to think through problems – have them collecting and analyzing data and building understandings for the effects the data have on the potential outcomes.

Vision: Teacher Change

As mentioned previously, teachers change slowly and often need a lot of support to make changes. This seems to be particularly true if the changes are more than simple behavioral changes in the classroom. Over the past several years, many models looking at teacher change have been developed based on research, experience, and literature reviews (e.g., Dwyer et al., 1991; Guskey, 1986; Little, 1993; Mevarech, 1995; Milken Exchange on Educational Technology, ca. 1998). They tend to show that teachers move through stages – gradually, working toward integrating new innovations of any kind. Mevarech (Mevarech, 1995) offers a model of change that is five stages. It is based on the work of Guskey; the Apple Classroom of Tomorrow research published by Dwyer, Ringstaff, and Sandholtz; and other discussions of teacher change spanning nearly 20 years. Mevarech proposes a model with five basic stages of adoption for any kind of teaching innovation. The five stages and their indicators as presented by Mevarech are:

1. Survival: in this stage the teacher, no matter how experienced, relives the experience of being a novice. Implementation is often mechanical and the changes to the classroom are as minimal as possible.
2. Exploring and bridging: the innovation is in place and running smoothly in the classroom, however the teacher is not reflective of thoughtful about the innovation meaning that no substantial improvements or adaptations are made.

3. Adaptation: as the teacher's confidence level rises, she becomes more reflective and more willing to make changes to the innovation. Further, she plans beyond the moment-to-moment problems.
4. Conceptual change: at this point the teacher is changing her pedagogical beliefs and becoming more focused on learning outcomes and misconceptions that the students are having.
5. Invention: at this stage, one which few teachers reach, the teacher takes the new knowledge developed from this process and applies it to new approaches to teaching and instruction.

In the first stage, the teachers often experience a sense of helplessness. In this stage of adoption, even the most experienced teacher becomes a novice again. This means that not only do the teachers feel frustration and uneasiness, but they are also forced to deal with more discipline and other problems common to inexperienced teachers (Mevarech, 1995). At this stage, the teachers need step-by-step guidance to help them feel comfortable, and they need a lot of motivation to continue with the changes (Mevarech, 1995). This implies that the teachers will not benefit from a simple one-shot workshop introducing the technique, rather, they will have to have extended support programs such as those reported in (Guskey, 1986; Krajcik, Blumenfeld, Marx, & Soloway, 1994; Miller, Bray, Vye, & Goldman, 1998; Staub, Mahon, & Miller, 1998). Without extended support, the teacher may claim to be "adapting" the innovation for her own students when, in reality, she is not using the innovation at all. Or, the teacher may be incorporating the innovation into the classroom while making as few changes to the normal activities of that classroom as

possible. According to the Professional Development Continuum (Milken Exchange on Educational Technology, ca. 1998), this first stage is often also riddled with a teacher- centered approach to learning in which "the educator directs and controls virtually all activity in the classroom."

Survival Stage

In the IU team's work with the simulations, we have seen teachers struggling at this survival stage. In one case, the teacher was using one of the banking simulations in a business math class. Rather than incorporating mathematics for banking into the class, such as balancing checkbooks or figuring simple interest, the teacher held the simulation totally separate from the math activities. There were certain days for math and other days for the computer. There was no use of the simulation in a true integrated fashion (Hawley & Duffy, unpublished). We believe, based on our experiences, that this is all the further teachers can be expected to go in their first year of use of the Classroom, Inc. simulations simply because they are dealing with new technology and cannot even think about the pedagogical consequences of the technology. This approach was also found in the decade of research in Apple's Classroom of Tomorrow (ACOT) project. In what Dwyer and his colleagues term the *entry phase*, the teachers struggled with the technology and made

essentially no changes to their teaching approaches despite the technology introduced into the classroom (Dwyer, Ringstaff, & Sandholtz, 1991).

Exploring and Bridging

The second stage of adoption in Mevarech's model is the exploring and bridging phase. Once the teachers have successfully survived the initial introduction of the innovation into their classroom, they move on to focus on differences between the new way of doing things and the old. Often in this stage, there is little or no thought given to how to improve or adapt the innovation for classroom use. Here, teachers tend to use the innovation exactly as it is prescribed. This means that the teacher gives no thought to improvement or adaptation of the innovation to fit her situation. Ideally, this is the target participant pool for the model being presented here. The teachers have willingly accepted the innovation, however, they are not reflective on the purpose or outcomes they desire from the use of the simulations. The teachers have moved beyond the survival stage and are comfortable with using the innovation in their classroom.

One teacher the IU research team worked with extensively reached this point rather quickly, possibly because we acted as her technical support so that she would not have to worry about the technology aspects. The IU research team also provided

ideas and worksheets to her for the simulation itself. So, she was almost immediately focusing on what to do outside of the simulation to support her students' learning. She developed some interesting activities ranging from having the students draw posters to promote environmental to having the students write business letters, but there was never discussion of the overall goals for these exercises and how they promoted the ultimate goal of promoting problem solving. Unlike Mevarech's discussion, however, our teacher was not focused on how her new way of teaching differed from her other teaching styles, rather, she focused on how her ideas about teaching and education in general differed from those of some of her peers. Because our research team only spoke with this teacher before beginning work with her and did not observe her classes, we cannot verify whether her teaching had always been somewhat learner-centered. However, as suggested in Mevarech, our teacher was preoccupied with her own teaching and herself more than with her students. This is not bad. In fact, this could be the first step toward developing a reflective teacher. It becomes the facilitator's role to promote positive reflection that will help the teacher move forward in the adoption cycle (Mevarech, 1995).

Adaptation and Conceptual Change

The next two steps of Mevarech's model are the goals of the professional development model developed for this research. If this research can identify a way to support teachers in moving through the second step and into the third and fourth step, adaptation and conceptual change, the training and facilitation efforts will likely be successful. It is these two stages where internalization of the innovation takes place. In the third stage, the teacher finally shifts away from the preoccupation with her own interests and concerns, to focus on student-centered considerations. According to Mevarech's work, this is also the first phase where teachers are comfortable enough with their efforts to discuss their problems or concerns with other teachers. However, as will be discussed later in this report, other research efforts at developing peer support groups with teachers have been successful from the very beginning of the adoption process. Therefore, Mevarech's work may simply indicate that this is the first stage where teachers will share with those outside of their network or support circle. This is also the first stage in which planning beyond moment-to-moment occurs. Dwyer and his colleagues found that at this stage, productivity became an issue – suddenly teachers shifted their reports away from technology issues and focused on how much faster students were able to work and how much

higher their engagement level was as a result of the technology (the innovation in question for the ACOT research) (Dwyer et al., 1991). Obviously, this stage represents an important plateau to achieve. As the Milken Exchange point out, in the adaptation stage,

> Learning is more active. Technology is used in many ways to support existing instruction and to make the instruction more engaging…The educator uses strategies of facilitation and guiding with increasing frequency….The educator guides, facilitates, allows for increased levels of student independence but within the organizational confines consistent with the educator's previous experience…Student self-direction becomes part of several activities in the classroom… (Milken Exchange on Educational Technology, ca. 1998, Curriculum, Learning and Assessment Indicators)

Finally, according to Mevarech, the conceptual change phase is where teachers change their pedagogical beliefs. It is here that reflection on what has happened in the classroom combines with a focus on the cognitive and psycho-social units of the learning to promote a deeper understanding of what the students are really doing in the environment. According to Posner, Strike, Hewson, & Gertzog (1982, in Mevarech, 1995) in order for teachers to reach this point, there are four conditions that must be met: (1) the teacher must be dissatisfied with the current classroom setup, (2) the teacher must develop a deep understanding of the innovation and consider it to be better than other things going on in her classroom, (3) the

teacher must see the innovation as being plausible for her environment, and (4) the innovation must prove to be useful in helping the learners to do more or do things better necessary. Obviously some of these conditions are necessary just to get the innovation into the classroom. However, just because the teacher is using a product does not guarantee that any of these four conditions is true. A teacher may be using something because it has been dictated that she will or because she just thought she would try it out. In the case of the CRI systems initiative, there is a very high likelihood that many teachers will be using these programs without understanding them and without believing in them. The research has shown that innovations forced on teachers in this way often only have a three-year lifespan in the teacher's classrooms (Mevarech, 1995). If the goals of CRI are to be met, it is vital that the facilitators help move teachers into the conceptual change stage of adoption and help the teachers work through any issues they have so that the four conditions necessary for change will be present. While this seems like a daunting goal, in the ACOT work, teachers reportedly started reaching this point after only two years of working with their innovations. Therefore, it is clear that teachers may be able to reach this point during the life cycle of technological innovations.

Invention

There is one more step in the adoption cycle, that of invention (Dwyer et al., 1991; Mevarech, 1995). Unfortunately, few teachers reach this point in their adoption of products. It is here that the teacher uses a deeply rooted understanding of the product to experiment with extension activities or new teaching styles. This goal is outside the realm of the current efforts in IU's work with the CRI teachers.

Summary

The important aspect of the literature on teacher change as it relates to the professional development framework is that we know we need to find ways to keep the teachers motivated, or to motivate them, to make the changes to their teaching. One potential way of doing this is by allowing the teacher to see results as they make changes. The implications of this are that the changes must be appealing (because they are low risk, easy to implement, or make sense) in order to get the teacher to try them out for long enough to see the affect the changes have on the students. Further, it may be easier to gain teacher acceptance of new innovations if the teachers believe in those innovations (Guskey, 1988a; Richardson, 1990). If the teachers do not believe in the innovations or ideas, there is probably little chance of facilitating any shift in their beliefs to achieve buy-in (Pajares, 1992). Finally, these models predict

that any change process is slow and that there is a great need for high levels of support throughout the earlier stages of development. These two keys, support and motivation, feed directly into the proximal goal notion presented in the framework.

Professional Development Framework

All of the work done to this point in creating a vision, examining our experience with the simulations, and developing an understanding of teacher change led to the next step – the creation of a framework that synthesized and addressed the issues laid out by previous work.

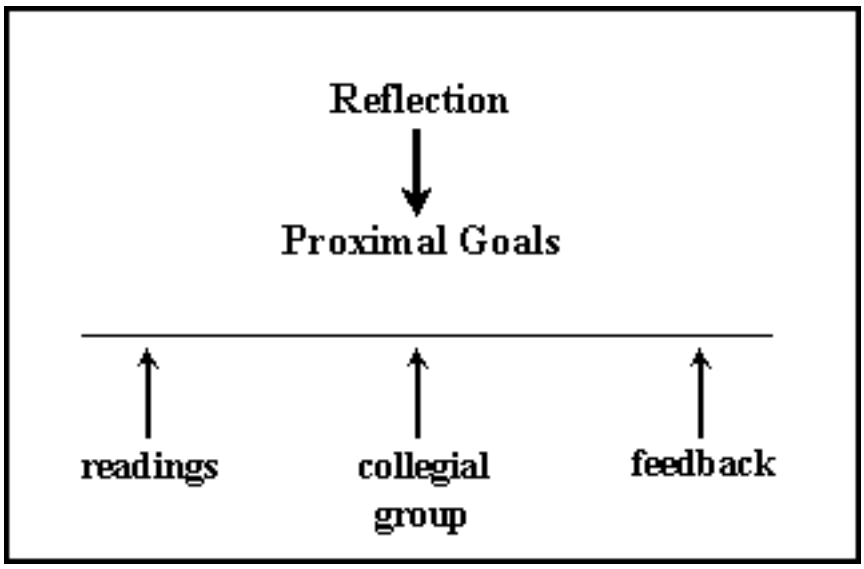
The framework (Figure 2.1) depicts a relationship in which development occurs through iterations of reflection on the enactment of proximal goals. It is implied that there will be a facilitator or peer coach to promote the reflective activities. In this framework, the teacher would set goals for herself that support her in becoming a facilitator, she would try them out, and reflect, to a facilitator or peer coach, on how well she did. Then, she would slowly stretch herself in new ways, presumably becoming more comfortable and, eventually, increasing her tolerance zone for student ownership and inquiry-based learning.

The framework also recognizes that this interplay does not occur apart from outside influences. To address some of the outside issues and to enhance the learning

environment for the teachers, supporting materials are included in the teacher's professional development activities in a way that should allow teachers immediate access to information they need. The resources should be chosen to help the teachers expand their understanding of learning, cooperative learning, critical thinking, problem solving, questioning, and other similar aspects of teaching and learning. Further, the model allows for a facilitator to provide guidance and support for the teachers as they embark in this change process. Finally, feedback from the facilitator allows the teacher to have an outside observer providing guidance and suggestions at the end of the lesson.

Not accidentally, this framework closely resembles the same kind of learner-centered environment the teachers should be developing in their own classrooms. Further, it implies a longitudinal implementation rather than attempting change in short workshops with no follow-up (Guskey, 1986, 1989). After all, "Teachers learn just as their students do: by studying, doing, and reflecting; by collaborating with other teachers; by looking closely at students and their work; and by sharing what they see." (Darling-Hammond, 1997, p. 319)

Figure 2.1: Original professional development framework



The Components of the Framework

Proximal Goals

The inclusion of proximal goals as one of the foundational elements of this framework comes from research done in the areas of motivation and self-efficacy as well as from some aspects of the teacher change literature. Proximal goals are conceived of as small, easily achievable goals that move the teacher toward the larger, distal goals. In our case, the distal goal for the teacher is becoming a facilitator.

Proximal goals, as a construct, are closely related to efficacy and motivation. In fact, they serve as a means to promote raised efficacy and to maintain a high level of intrinsic motivation when used (e.g., Bandura & Schunk, 1981). Because of this relationship, it is necessary to explore efficacy further in order to fully understand the importance of proximal goals.

Efficacy and Motivation

Research has found that efficacy and adoption of innovations are closely related (Guskey, 1988b; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). For example, Guskey (1988) found that teachers with higher efficacy levels tended to see more value in innovations. Further, McCombs (McCombs & Lauer, 1997) found in her validity studies on the Learner-Centered Battery that teacher with higher efficacy ratings also tended to be the ones who were more learner-centered. There are many possible explanations for this relationship between efficacy and willingness to adopt new innovations, but all relate strongly to the power of motivation as a component of human behavior. While efficacy can be considered from many perspectives (Tschannen-Moran et al., 1998), those most important to this research are:

- instructional efficacy – a teacher's belief in the value of an instructional approach;
- teacher efficacy – a teacher's belief in the ability of teachers, in general, to influence student learning;

- personal teaching efficacy – a teacher's belief in her own ability to influence her students' learning. This is similar to self-efficacy in that it is the person's beliefs about his or her personal abilities to achieve something. However, it is separated from self-efficacy because it relates only to the person's feelings about teaching.

The findings from previous research suggest that our primary focus in professional development efforts may need to be personal teaching efficacy since that determines perceived difficulty of implementing an innovation and seems to be tied to the teachers' perceptions of how consistent an innovation is with their current practice,

Teachers' belief in a product to improve their students' performance tends to increase when they can see positive results as their students experience the program (Guskey, 1986; Guskey, 1989). In fact, in a research effort reported in 1989, Guskey found that teachers who participate in the adoption of an innovation (mastery learning) willingly, the teachers with the highest efficacy were the ones who felt that this new innovation was more congruent with their current practice and they also felt it was less effort to implement than the teachers who were less efficacious (Guskey, 1988b). Unfortunately, we know that teachers involved with the CRI programs currently tend not to adopt the teaching styles (Hawley & Duffy, 1997; Hawley & Duffy, 1998b), which means that they are likely not seeing as powerful results as they could be from their students. Therefore, they may decide that the programs are either not effective or that some other way, presumably one more consonant with the

teachers' entry beliefs, is more effective. If such a belief emerges, adoption of the CRI program may never fully occur.

Ten years after the Guskey study, Ghaith and Yaghi (1997) revisited his work and pushed the understanding of efficacy further. They chose to use an innovation potentially more unlike teachers' existing classroom practice than mastery learning and which has been found to be successful in separate experiments. The researchers used a four-day workshop to introduce 25 teachers to Student Teams Achievement Divisions (STAD), a cooperative learning program. At the end of the four days, the researchers administered 3 separate instruments, one for demographic data, one to gauge personal teaching efficacy and general teaching efficacy, and a third, developed by Guskey, to gauge the teachers' attitudes toward the implementation of the instructional innovation. The data collected reveal similar findings to those of Guskey with one major exception. This study found that the longer teachers had been teaching, the more difficult they perceived implementing STAD to be. Further, they found that teachers with higher levels of experience felt that their ability to promote learning was limited by out-of-school barriers. Like Guskey, however, Ghaith and Yaghi found that the higher a teacher's sense of personal teaching efficacy is, the more likely she will be to implement the innovation. This research concludes that personal teaching efficacy and general teaching efficacy are "distinct dimensions of

professional efficacy" (p. 457). This supports Woolfolk and Hoy who concluded that the two constructs should be measured separately. Further, this research finds that it is the personal teaching efficacy, rather than the general teaching efficacy, which determined likeliness to implement the innovation. Meaning that it is a teacher's belief in her own ability to promote learning that ultimately determines what she will or will not use in a classroom.

Gibson and Dembo (Gibson & Dembo, 1984) found in their case studies of 8 teachers (4 highly efficacious and 4 low-efficacious) at two separate schools, that teachers with higher efficacy tended to spend significantly ($p<.05$) less time in small group instruction than those with low efficacy. When paired with the observation comments provided from the research, it is easy to see that this is very important. The teachers with low-efficacy tended to spend significantly more time working with small groups (48% of their time) yet displayed little sureness while working with these groups. Further, the low-efficacious teachers could not maintain the rest of the class while working with a single group (p. 578), therefore only a few students were engaged in learning at any point in time. Conversely, the highly efficacious teachers were able to maintain control over the classroom during small group and large group instruction and conveyed a sense of sureness in their efforts. Therefore, more students spent more time engaged in learning activity than in the low-efficacy

classroom. Further, more efficacious teachers were found to never criticize their students for incorrect responses, whereas teachers with low efficacy offered criticism 4% of the time. For this professional development research effort, the implications of Gibson and Dembo's work are twofold. First, in creating the kinds of learner-centered classroom environments described here, it is imperative that the teacher not be critical of student efforts. Therefore, this is a vital consideration. Also, the classroom control issue highlighted in the time on task data is another consideration. While we want to promote small group work, which, at first, Gibson and Dembo seem to imply is not as productive a use of time as whole-group instruction, we are very concerned with student engagement. The data presented in the article implies that a teacher with a high efficacy level is more likely to be able to promote high levels of student engagement than a teacher with low-efficacy.

Through research of the kind presented above, we can see that having a high sense of self-efficacy, in this case, personal teaching efficacy, is vital to the initial adoption as well as successful use of innovations. But, we have not yet explored how we develop efficacy. One method that seems to hold promise is proximal goals and, indeed, goal setting in general.

Proximal Goals and Motivation

Bandura and Schunk (1981) conducted a study centered on how to develop interest in students who lack it. They selected 40 low-achieving math students between seven and ten years old. For this experiment, the students were supposed to work through a self-directed learning unit that covered the subskills of subtraction. The materials were the same for each of the treatment groups and all of the students were told that that would have seven 30-minute sessions to complete their work. The students were each assigned to one of four groups: 1) proximal goals group – it was suggested to these students that they consider finishing six pages of instruction per period; 2) distal goals – for these students, the goal was defined as completing the 42 pages of instruction by the end of the seven periods; 3) no goals – these students were told to complete as many pages of the instruction as they could during their seven days, and 4) no treatment – this group did not receive the materials, they were used as a control for any testing effects. The findings of the research indicated that students assigned to the proximal goals group had significantly higher self-efficacy than any other group at the end of the instruction ($p<.05$ vs. distal, $p<.05$ vs. no goals, and $p<.01$ vs. no treatment). While the students in the distal goals group scored higher levels of self-efficacy than the control group, they did not differ significantly from the group that had no goals. Further, the mathematical

performance of the students indicated that all of the students in the treatment groups did experience significant gains in their mathematical abilities ($p<.01$) over the no treatment group. As with the self-efficacy, however, there was more gain in ability in the proximal goals group than in the other two groups. Finally, the proximal goal group also exhibited higher levels of persistence and a higher level of intrinsic motivation at the end of the experiment than at the beginning. In fact, 90% of the students who were assigned to the proximal goals group performed mathematical problems in a free choice situation as compared to only 40% in no goals, and 10% in distal goals.

A likely explanation for these kinds of gains in both perceived self-efficacy and intrinsic motivation relate comes from our understanding of motivation and goal setting processes in general. In 1988, Bandura noted:

> "People tend to avoid activities and situations they believe exceed their coping capabilities, but they readily undertake challenging activities and select social environments they judge themselves capable of handling." ((Bandura, 1989), p. 1178)

This statement indicates just how powerful our perception of our abilities (self-efficacy) can be in determining what we do in our lives. Bandura also asserts that people will set higher goal challenges for themselves if their perceived self-efficacy is higher (Bandura, 1992). The value of these goals is in their strong bond with

intrinsic motivation – the factor that carries people through difficult challenges. Bandura specifically looks at teachers and notes that their day-to-day activities bring them into constant situations where they are facing non-achievement of their goals, leading to a lowered sense of efficacy and ultimately leads to burnout (Chwalisz, Altmaier, & Russell as summarized in Bandura, 1992).

Dweck (1986) considers these issues from a different perspective, the perspective of goals setting as it relates to perception. Like Bandura, she argues that in order to learn, we must challenge ourselves. Her work has indicated that we are best at choosing tasks that are neither too easy nor too difficult when our perception of our abilities are high. The lower peoples' perceptions, the more likely they are to work outside of their zone of proximal development – aiming either too high or too low. Further, Dweck's work and the work she cites indicate that people are best at succeeding if they perceive and set goals that are learning goals, aimed at developing skills, rather than mastery goals, aimed at achieving a particular end. In fact, according to Dweck, performance goals can create environments that actually undermine the intrinsic motivation that is necessary to maintain engagement for learning. This is because people who focus on performance goals see success as being achievement of the goal and perceive anything less than this achievement to be a failure. Further, they believe that failure is linked to their abilities. People who set

learning goals, however, tend to view learning as the measure of success and failure as a means for improvement (Dweck, 1986).

My assertion from this literature on self-efficacy and motivation is that the teachers should be introduced to proximal goals to prevent burnout, raise the potential implementation of learner-centered teaching practices during the use of the simulations, and increase the likelihood of continued success. We have seen in Bandura and Schunk (1981) that proximal goals can raise intrinsic motivation as well as skill level. Both of these areas are vital to the success of this professional development effort – our teachers must develop skills necessary to the learner-centered environment such as questioning and modeling and they must be willing to implement this new, unfamiliar form of teaching. Further, we need to keep their intrinsic motivation and personal teaching efficacy high while they do implement these innovations. This will ensure a lasting implementation because the teachers will first be stretching their own abilities, something that requires confidence and determination to succeed at. Further, they will begin recognizing success in their students which will not only help avoid the academic burnout that Bandura (1992) discussed, but also lead them to further efforts in the adoption of the innovation as Guskey (1988) pointed out.

Proximal Goals in This Framework

There are some important differences between the notion of proximal goals as outlined by Bandura and Schunk (1981) and the way they were intended to be implemented in this research. The primary consideration was the orientation of the goals. In much proximal goals work, the goals have been focused on particular behavioral goals that were repetitive and clear. In the approach to professional development proposed in my research, proximal goals, while small and manageable, were to exist as separate behaviors all culminating in an overall change in the learning environment in one aspect or another. For instance, Bandura and Schunk's students were to complete six pages of work each period in order to complete a self-guided mathematics course. These are both very concrete goals and the proximal goals directly lead to the distal goal. My teachers were asked to become facilitators – a far less concrete goal that included both behavioral and belief aspects. There was no concrete progression of activities that ultimately led the teachers to this distal goal. There were, however, small achievable steps that could be combined to describe facilitation. Further, these steps each pushed the teachers further away from the "chalk and talk" or "directive" forms of teaching they were experienced in. Thus, the proximal goals served to increase their efficacy by leading them to new methods, but working within their zone of proximal development. For instance, one of the

subgoals of becoming a facilitator was to improve in the use of guiding questions. If we were to focus on that skill, the teacher's proximal goal might be to approach each team at least one time during the scenario and ask a question. The next goal could be to ask each team one higher-level question, probably a "why?" question, during each scenario. Another aspect of this same goal may be to focus on question development. Therefore, to achieve the goal of improving questioning, we may have needed to work on teacher interaction with the students and with teacher preparation. This approach to proximal goals was to be a multifaceted approach individualized for each teacher.

Reflection

Since Schon's proposition that professionals should be reflective in their actions (Schon, 1987), there have been numerous articles lauding the benefits of teachers using reflection in their own profession (e.g.; Miller, et al., 1998; Staub et al., 1998; Wedman, et al., 1998). For this study, there were two compelling reasons to promote the development of reflective practitioners: 1) reflection can generate the internal dissonance required to close the gap between teachers' actions and their beliefs about learning (Wedman et al., 1998) and 2) reflection forces teachers to examine their work with a critical eye and make improvements as necessary. In fact,

Richardson (1990) pushes this second point arguing that teachers rely heavily on tacit knowledge and actions rather than on reasoned, reflective practice. She continues saying that the teacher's experience, which is the basis for her actions is,

> "...educative only with reflection. This suggests that the improvement of the teacher learning process requires acknowledging and building upon teachers' experiences, and promoting reflection on those experiences." (p.12).

In one recent consideration of reflection as a means of aligning teacher beliefs and practice, Staub's research team found that asking directed reflective questions helped focus teachers, raised the consistency of their lessons, and helped them generate lessons that were more closely tied to the goals of their various teaching units (Staub et al., 1998). His team worked as coaches with teachers who were being prepared to be teacher leaders. They perceived the use of the content-focused questioning to be training them for their upcoming role rather than as remediation. The frequency of the coaching sessions varied based on the availability of the teachers, but generally happened either every other week or monthly. The template for questioning pushed the teachers to think about how their lessons fit into the larger picture of their goals for the students. They required the teachers to identify necessary incoming skills, explain the relationship between a given activity and the goals for that activity, and reflect on how to improve the activity in the

future. After following several teachers for a period of a few months, the data collected points to the effectiveness in helping teachers focus their lessons better. More than any other single device, reflection promotes the internalization and true adoption of information and the development of knowledge.

In a different study that also looked at aligning practice with beliefs, Wedman and her colleagues (Wedman et al., 1998) looked at 11 students in a course that introduced a system of feedback based on reflective evaluation of videotapes. In this study, the students, both experienced teachers and undergraduates, participated in a paper-based beliefs survey. The data from this indicated that through the use of self-evaluation of their teaching, the students began to see teaching as a process rather than as motivation or content. At the beginning of the study about half of the students viewed teaching as a process-oriented activity and by the end, all of the students reflected this shift. Wedman and her colleagues conducted 4 in-depth case studies with a subset of these students in order to gain a greater understanding of the changes they anticipated. In three of the cases, the teachers (two experienced teachers and one undergraduate with limited experience) were able to bring their actions in line with their beliefs. The beliefs had been stated before they were videotaped and before they had evaluated themselves or received any feedback on that evaluation. The fourth case was also of an undergraduate with limited classroom

experience. He was unable to benefit from self-evaluation because he found ways to discount any feedback he received. He blamed his cooperating teacher's lack of trust or student laziness for any limitations in his own performance. The important finding here is that reflection can effect change in teaching behaviors and perceptions.

In another study, Hunsaker and Johnston (1992) worked collaboratively as teacher and student and as researcher and participant for four years. In the case study report of Hunsaker's development as a teacher, there was a strong emphasis on the role reflection played in helping her move toward becoming more learner-centered and to become a questioner. The study concluded that time and support were key in helping Hunsaker make the transition to this new teaching style. The transitions involved more than simple behavioral changes because the teacher had to examine her beliefs and the contexts she works in. While the report did not include the impact of the teacher's predisposition in its findings, it seemed relevant to the study that Hunsaker had sought out a new approach to teaching by returning to graduate school.

Krajcik and his colleagues at The University of Michigan, conducted a multi-year study on project-based science instruction that included implementing a professional development model that was based on enactment, reflection, and collaboration (Blumenfeld et al., 1994; Krajcik et al., 1994; Ladewski, et al., 1994; Marx et al., 1994). This study supported that idea of reflection as a medium for

supporting teachers evaluation and change as well as supporting the idea of reflection bringing beliefs and actions together. In their work the research team worked with several teachers, including completing case studies on five of the teachers. In their first year of work, the team found that the teacher's were struggling more with practices than the underlying theories of those practices. In fact, they noted that,

> "The teachers initially approached the effort as they had past teaching-enhancement activities. They saw it as an opportunity to develop new techniques, such as using technology or working with cooperative groups, rather than as an approach that required fundamental shifts in their beliefs and instructional practice." (Blumenfeld et al., 1994, p. 542)

However, through constant iterations of the model (enactment, collaboration, and reflection), the researchers saw movement. The teachers became more collaborative. They offered far more real support to each that focused on real issues rather than simply discussing their likes and dislikes and not growing at all through their interactions. Further, while change was extremely slow and unique to each person, at the end of the first year of implementation, the teachers had each moved to be congruent with some aspects of project-based instruction.

Implications of the Research on this Professional Development Effort

The need for reflection in a professional development effort seems indisputable. There are obvious values to reflection. The primary goal of the reflection, as reported in these articles, is to make the teachers aware of their own beliefs and their actions and to become self-evaluators to bring their beliefs and their actions in line with each other. Further, as pointed out by Schon (1987), reflection should support the teachers in becoming more knowledgeable about their own teaching. Schon points out that there is a traditional tendency for professionals to view certain qualities as being beyond concrete description. He asserts that this perpetuates a belief that only some people can be masters in their field. This is simply not true. Reflection acts as a means of helping teachers recognize those aspects that separate the expert teacher from the experienced teacher. This is one of the many compelling reasons to include reflection at the heart of professional development activities.

In all of these articles, there was a common thread which, while not discussed in the findings, is very important. All of these research efforts included an outsider – a person acting as a professional developer – who guided the teachers through the reflective process. In some instances, such as the Staub research, the person used a script, in other instances, the person acted more as a sounding board or as a guide,

such as the Hunsaker work. In each case however, the outsider brought a theoretical grounding to the discussion that the teachers seemed to be without. In the Blumenfeld (Blumenfeld et al., 1994) work, there are many allusions to both his own teacher's focus on skill-level understandings and other places in the literature where this is common. In trying to effect change, it is vital for the professional developer to keep moving the teachers toward reflection on their actions as they relate to the theories. This is a slow process and one which, pointed out by Hunsaker, involves a change in beliefs as much as a change in practices.

Another aspect of this literature that seems particularly important to the current research effort is the lack of specificity of how to promote teacher reflection. In each of these articles, there were different reflective devices used. The University of Michigan work used peer groups in which teachers critically evaluated their work as well as their peers' work. The Staub involved teachers answering interview questions once a week. Other efforts used a combination of journaling and interview. Each of these techniques led to the desired changes, leaving the impression that the method of reflection is far less important than the act of reflection.

Finally, the literature reminds us that in dealing with beliefs, we often see instances in which a person's beliefs are internally inconsistent with each other. This seems particularly important in practice given that, "[Roehler, et al.] hypothesized

that expert teachers are more effective than less expert teachers because their knowledge structures are more coherent and integrated, making it easier for them to access knowledge and make decisions more quickly. In a case study of preservice teachers, Johnson (1987) found that students whose knowledge structures were coherent and integrated taught coherent and integrated lessons, whereas students whose knowledge structures contained few integrated elements taught lessons that were less coherent and integrated." (Richardson, 1994, p. 95) While these examples both point to a more information processing perspective of thinking than I propose for this work, it seems that the findings still indicate that there is a benefit in teaching ability when teachers are more reflective. If reflection offers us a device by which we can make beliefs more consistent and coherent, then it seems worth pursuing as a professional development tool to raise the expertise level of all participants.

Reflection in this Framework

The role of reflection in the professional development effort proposed here is to both help the teachers understand their beliefs and to bring their beliefs and their actions in line with each other. When there were indications that a teacher's beliefs were inconsistent with the goal of developing a learner-centered classroom, it became my responsibility as the professional developer to use reflection to help the

teacher to begin shifting her beliefs. This occurred through discussions of learning environments that are effective, capitalizing on the aspects of the teacher's beliefs that are learner-centered, and supporting the teacher in talking through her frustrations in order to identify her own solutions.

For this research, a variation of Staub's "content-focused coaching" (Staub et al., 1998) formed the foundation of much of the reflective activity. Through the development of questions similar to those he used, I provided a foundation for the teachers' thinking about their activities. Questions about the lesson's goals and learner's prior knowledge appeared in the form of informal interview questions. Likewise, questions about the success of a lesson, the teacher's role, and the next step formed the framework for our discussions. Ideally these questions helped the teachers think through their planning as well as offering me insight into how they were thinking at each point in our work.

Collegial Groups

As already noted in the research cited for reflection, there is a strong movement in professional development to build a sense of collegiality among teachers (e.g., Blumenfeld et al., 1994; Little, 1993). These efforts strive not only to provide a network for teachers, who are normally forced to work entirely alone, but

also to provide pedagogical and cognitive development opportunities for the teachers. There is a growing body of literature that lauds the values of this approach to professional development. For instance, Sparks concluded 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). In their work with teachers, the research team from the University of Michigan also found that working in small groups helped their teachers move toward their goals (Blumenfeld et al., 1994). In another research effort (Miller et al., 1998), it was found that working with teachers as little as two times per month was effective in raising reflection and focused discussions.

In their two-year study, Weinstein, Madison, and Kuklinski (Weinstein, Madison, & Kuklinski, 1995) looked at the perceived constraints various factors had on the teachers’ performance each week. They implemented a system in which a small group of teachers and administrators met with two researchers each week for two hours to discuss literature they read as part of the project and to talk about innovations. The goal of the research was to minimize the negative perceptions the teachers had about their students (who were poor performers) by disconfirming negative beliefs which would cause an increase in performance expectations. The

meetings were focused on the readings, materials, and practical support for the change effort. Over time, there was a tendency for movement from "perceived obstacles" toward "opportunities" as the teachers began to feel more efficacious – believing that they could, indeed, influence student learning. The number of perceived constraints (classified according to origin: teacher, student, system, parent, and project) tended to go down over time. In fact, in the second year of the project there were almost no perceived constraints except in one meeting which was attended by one new teacher and one teacher who had only occasionally participated in the group.

In another research effort, more aligned with the goals of my research, Richardson (1992) dealt with the issues that surround a "new generation" of staff development. She describes this new movement as being comprised of programs that "attempt to introduce new ways of thinking and practices within a context that attends to what we know about how and why teachers change their practices. This new form of staff development is generally cognitively framed in ways of helping teachers themselves explore their beliefs and knowledge, reconstruct their premises related to teaching and learning, and alter their practices" (p. 287). In her research she worked with teachers to create a teacher-driven conversation. She wanted to have the teachers tell her when they needed research-based practices and she wanted them

to develop their own questions to guide the conversation. In Richardson's research she found that the kinds of interactions that received the highest interest from the teachers were the lectures that arose specifically from teacher questions and the sharing of classroom stories in an impromptu way associated with the direction of the conversation. Remarkably, the lowest interest items were "show and tell" pieces in which the teachers prepared for the sharing of their classroom materials and the "new suggestions" that arose from the discourse providing new techniques for the teachers to try out in their own classes. Richardson concludes that because the unprepared lecture arising from conversation was the "mode of presentation that best met our goal of introducing alternative practices and their theoretical bases, and to stimulate interest and discussion" (p. 297) that a staff developer in this kind of collegial group had to have considerable knowledge of the topics and learning theories in order to present topics spontaneously. If the topics were prepared for the next week, the interest level was lower.

Collegial Groups in This Research

There are many important findings about peer groups in the literature. Most important is the sense that they provide the kind of ongoing support necessary for teacher change (Hannay et al., 1994). It also provides the link between the

professional development and the desired classroom environment that Darling-Hammond promotes (Darling-Hammond, 1997).

The research on collegial groups indicates that it is possible to have a group that is teacher led. According to Blumenfeld et al (1994), it will take several months before the teachers will actively support each other rather than offering superficial support. Richardson's work indicates that the group will work best toward supporting conceptual change if there is a knowledgeable professional development person in the group. However, this does not mean that person must plan or lead the group's activities. This allowed there to be a "sense of shared experience" (Richardson, 1992, p. 297)

The collegial support portion of this professional development framework closely resembled the environment described by Richardson (1992). The topics were those that the teachers felt should be discussed and the emphasis was on supporting their theoretical and practical needs through impromptu discussions. This does not mean there was no guiding direction. Each week, I planned the meetings, but did not generally adhere to the plan once the teachers began their exploring viable areas that arose from their own concerns or observations.

Other Support Structures

Feedback

In this research effort, there were two other support structures at work: one-on-one mentoring/feedback system and professional development resources provided to the teacher. The use of a one-on-one feedback system served two purposes. First, it modeled a peer coaching method of teaching (Showers & Joyce, 1996). This was the approach that I wanted the peer group to adopt because no one is considered the expert, rather the approach recognizes that everyone has viable opinions. In many cases, the one-on-one coaching put me in the role of the sounding board as the teacher talked through the issues that concerned her about her class. The mentoring aspect was a very important part of bringing the professional development effort into the context of the teacher's world (Guskey, 1986; Hannay et al., 1994). The mentoring was an aspect of the framework that generally involved me pointing out the things that went well during the class period and highlighting small changes each teacher may have been able to make to improve their performance more. The decision to focus on the positive aspects was one made in an effort to model, in a sense, good interactions.

Professional Development Resources

Much of the intellectual discussion and research on what is means to be a good teacher focuses on the teacher developing a knowledge of learning theory, pedagogical theory, and content expertise (Borko & Putnam, 1995; Richardson, 1990; Staub et al., 1998). However, there are no systems in place to support teachers in their acquisition of the information necessary to developing their understanding. Within this framework of professional development, the facilitator provided resources to support the development of requisite knowledge for successful implementation of the CRI simulations. Further, by including this selection of resources, in the form of a notebook of articles, books, and summaries, I help model the environment I wanted the teachers to adopt for their own classrooms. By providing them with resources that covered a variety of aspects of coaching (i.e., questioning, thinking, constructivist teaching, cooperative learning, cooperative groups, etc.), I gave them ready access to resources for answering their own questions. The information provided as part of the resources was taken from standard teacher-oriented resources, such as journals and books. By fostering a culture and environment that makes it easy for the teachers to explore new ideas, I intended to provide them with the opportunity to continue their professional development on their own.

Conclusion

The literature on teacher training does not provide much guidance on how to create a successful professional development strategy. In fact, much of the literature focuses on failed efforts or on anecdotal stories about the authors' experiences in doing professional development (Richardson, 1990). Fortunately, in recent years, there has been a more substantial focus on professional development, rather than training, and on how to create successful programs. From this literature, we know that, "If staff development ignores context, as in the case of many one-shot workshops or brief visits by "experts," it probably will not be as successful as staff development that is deeply connected to schools and classrooms of the participants." (Griffin as quoted in Hannay, et al., 1994, p. 36). Likewise, we know that in addition to working with teachers in their own environments, our development efforts must use the same strategies that we are asking our teachers to adopt (Borko & Putnam, 1995).

Considering what is known about the power of social negotiation in the learning process, it is not surprising that, "increased expertise [and] committed and positive relationships will tend to develop among teachers, social support among staff members will tend to increase, and professional self-esteem will tend to be enhanced" if collegial groups become part of the learning environment for teachers

(Johnson & Johnson as quoted in Miller et al., 1998). We are learning that teachers, like other professionals, do not work best alone. They benefit from having supervision and from having support structures to fall back on when they are implementing new approaches (Borko & Putnam, 1995).

Further, we know that the goals of professional development should always be to help teachers develop new ways of thinking about learning, learners, and content (Borko, 1995). Certainly not surprisingly, Linda Darling-Hammond argues that the best way to design professional development efforts is to borrow from the best way to develop classrooms;

> Teachers learn just as their students do: by studying, doing, and reflecting; by collaborating with other teachers; by looking closely at students and their work; and by sharing what they see. (1997)

All of the elements of the same active learning measures we are asking for teachers to use with their students are precisely the structures that allow teachers to learn best.

The professional development approach proposed here considered all of these elements in its efforts to bring about and support teacher change. The goal of this research effort centered around the framework. My aim was to evolve my thinking beyond what I could learn simply from reading about professional development and to alter the framework based on my learning.