Journal of Elementary Science Education, Vol. 16, No. 2 (Fall 2004), pp. 65-80.

Negotiating Multiple Tensions with Others in Learning to Teach Elementary Science: The Case of Bernia

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The purpose of this study was to examine what kinds of tensions, conflicts, and difficulties a prospective elementary teacher paid special attention to in the process of interacting with others to learn to teach elementary science during the internship year, and to describe how the novice teacher responded to and finally negotiated those tensions in response to social and institutional expectations of her university instructor, mentor teacher, field instructor, and peers to establish her own image of a "good science teacher self." The findings showed that the tensions with others had to do with the beginning teacher's different values and beliefs about the usefulness of the teacher education program and support from others. Specifically, this study uncovered the particular ways in which the teacher candidate developed her own social aspect of identity through negotiating the tensions generated from her social relationships with the various people involved, and in attempting to meet their expectations. She ended up choosing a way of using her own personal values and beliefs to resolve the tensions by frequently either neglecting or resisting others' expectations. The findings highlight that the holding of different values and beliefs seemed to create difficulties in nurturing effective communication among the people around the beginning teacher. This especially draws our attention to the need to help teacher candidates realize what can be valuable to pursue in elementary science teaching, and to improve and change their ways of science teaching in an effort to modify their frame of reference toward more effective science teaching.

Introduction

In recent years, developing an individual sense of what science teaching should be has been recognized as an important aspect of a science teacher's learning to teach. It has been widely discussed how a beginning teacher develops her or his own identity for becoming a good science teacher (Abell, 2000; Helms, 1998; Jackson, 2001): How do personal and internalized struggles formulate the science teacher's self either by conceding, refusing, or negotiating tensions that are conveyed through the social relationships established in a professional community?

The process of establishing effective professional relationships with others is often described as quite complex and problematic. It is not always a rosy, dreamlike, or fantastic process. Rather, it is an uneven and complex process, with multiple tensions involved. Many different dilemmas and frustrations take place

in the teacher's personal struggles (Katz & Raths, 1992; Lampert, 1985; Volkmann & Anderson, 1998). This often includes physical fatigue, stress, financial worries, loneliness, isolation, and disillusionment (Bolam, 1987). It is also understood that it is a lonely, long journey for a beginning teacher to manage the multiple tensions involved in the process of learning to teach elementary science (Ryan, 1986).

This study takes the stance that the process of constructing a teacher identity through professional relationships is understood not only as a way to conceptualize multiple positions within varied interactions and to recognize the various tensions that occur between different people and agencies, but also as a way to allow the teacher to actively negotiate the tensions generated, construct independent meanings, and rewrite personal experiences within her or his relationships with others (Jackson, 2001). This study answers the question of what tensions are involved in the process of a teacher's interacting with, and responding to, others' expectations and how the beginning teacher shapes her or his identity through this complicated process.

Purpose of the Study

The purpose of this study is to better understand how a prospective elementary teacher struggled with multiple tensions that developed in her relationships with others and to describe how she finally negotiated those tensions in response to social and institutional expectations of her university instructor, mentor teacher, field instructor, and peers, respectively. First, this study examines what kinds of tensions, conflicts, and difficulties the prospective elementary teacher paid special attention to in the process of interacting with others and fulfilling various expectations. Second, it investigates how the novice teacher responded to and finally negotiated those tensions in learning to teach elementary science and establishing her own image of a "good science teacher self."

Theoretical Background

Learning to teach science can be partly understood as a process of developing an individual science teacher identity (Helms, 1998) in the sense that a teacher establishes her or his own image of what science teaching can be. The teacher identity is defined as dynamically constructed in social and cultural contexts (Tierney, 1993; Volkmann & Anderson, 1998). Some research suggests that when a beginning teacher identifies and constructs their image of a science teacher, it is tied to how the teacher comes to an understanding of the subject matter and confidence in teaching practice (Beijaard, Verloop, & Vermunt, 2000; Freppon & MacGillivary, 1996; Helms, 1998). More importantly, however, it is often seen as being closely related and connected to others in the professional community (Kennedy, 1991). The process of developing the science teacher self cannot be isolated from relationships with other people such as instructors at the university, mentor teachers in field placements, peer beginning teachers, and even various laymen. It is integrated and actively interactive with others (DeCorse & Vogtle, 1997).

Some researchers have also studied how teachers become aware of, and develop their own image of, science teaching, since the establishment of personal identity regarding what science teaching they engage in will significantly affect their ways of approaching science teaching and learning (Abell, 2000). For instance, Sarbin and Scheibe (1983) define the teacher self as existing in social structures

in three dimensions: (1) value, (2) status/position, and (3) involvement. All three dimensions are interactive within social structure and determine the social identity of a teacher self. The teacher self is involved in various levels of roles or behaviors that are enacted to achieve the occupancy of a particular status. Different statuses and degrees of involvement are related to gains or losses in the value of a social identity. A person's social identity is a product of social interaction through involvement with his or her value, by validating his or her social positions. Based on this definition, it is possible to see that an individual teacher's development of an image of what science teaching is would be related to his or her interactions with, and the involvement of, other people.

Helms (1998) suggests a sense of science teacher identity as a self in terms of four dimensions: (1) values and beliefs; (2) institutional, cultural, and social expectations, or what people think others expect; (3) actions; and (4) future self/society—where people see themselves going or the kind of people they want to become. These four dimensions are closely connected to and co-influenced by each other within social and cultural contexts. Helms argues that values and beliefs have a strong link with the future self and important but weaker links with actions. In particular, there exists an important link between actions and what others are believed to expect.

To establish a personal image of what science teaching should be, it is also essential to construct an individual teacher identity. As Abell (2000) and Helms (1998) argue, however, the individual teacher identity is socially shaped through validating procedures in the process of fulfilling social expectations and having social interactions with significant others because constructing social identity is strongly emphasized as being determined by the various dynamic functions within social relationships. Lave and Wenger (1991) point out that learning involves a construction of identity that helps make a different person through active participation in social discourses with other people. The social nature of teacher identity involves others in shaping the teacher self, by interacting and influencing each other and co-constructing values. It makes it possible to accept or reject others' expectations, creating tensions among them, and negotiating their roles and status in the social involvement/actions. In particular, the social nature of building teacher identity is commonly accompanied by a lot of tensions and complexity. It includes interaction with others, meeting others' expectations, taking validation through appropriate role enactment, and being able to keep one's values in validated social positions.

This study focuses mainly on a prospective elementary teacher's ways of dealing with the various tensions mostly caused by social interaction with and expectations from the significant others in her professional science teaching community.

Method

Subject's Background

Bernia was in the second semester of her internship year at a five-year teacher education program at a large university located in the mid-eastern United States. She started her teacher education program as a post-baccalaureate after graduating with a B.A. degree in early child development. Bernia volunteered to participate in this study and showed enthusiasm for learning things in her teacher education methods course and for teaching the "Food for Plants" unit in her field placement

through her internship year. She was one of the strongest candidates among the same-year cohort in her teacher education program in terms of her content understanding, enthusiasm, and responsibility. She was placed in a second-grade classroom under an experienced mentor teacher, Helen, who had been actively involved in science study groups and workshops for many years. Bernia's course instructor, Patrick, taught the internship elementary science methods class. Patrick had had long experience teaching the elementary methods class. He was very energetic and envisioned that his interns would become proactive elementary science science teachers who know how and what to do to facilitate scientific inquiry and conceptual understanding for elementary students. Patrick was excited to have the chance to see how his intern worked with her mentor teacher to apply the unit plans Patrick developed a year before.

Data Collection

This study uses qualitative ethnographic methodology (Erickson, 1986; Spindler & Spindler, 1992). As a participant observer, the researcher observed the intern's teaching and learning process in her classroom "lead-teaching" as well as her teacher education methods class. The researcher watched Bernia's multiple interactions with second-grade students in the field placement, with her peers in small group discussions in the teacher education classroom, and with the instructor and the mentor teacher. The researcher visited her science classroom during the six-week lead-teaching period and her teacher education methods class for a whole semester. All of her teaching experiences were videotaped and all of the dialogues in the methods class were audiotaped. In order to better understand the intern's social interactions, feelings, and perceptions of others and of the teacher education program, the researcher interviewed Bernia after each time she taught a class, in addition to five structured interviews with her during the semester, as well as with her teacher education instructor and her mentor teacher after the internship year ended. Letters and e-mails were also used as ways of getting her responses to further questions. The data included in this study consist of the intern's personal stories, descriptions, and perceptions toward the other people with whom she had interacted (see "Notes").

Data Analysis

Data analysis included examining transcriptions of the videotapes of her classroom teaching and the audiotapes of interviews, and reviewing the field notes from the methods class and the lead-teaching classroom. The extensive interview data and the video- and audiotape data were compared to triangulate the major findings and point out the main features between the different people's interactions with the intern teacher in order to understand the process of negotiating tensions and shaping the intern's teacher identity. The researcher developed an analytical framework that includes detailed coding schemes of characteristics of various tensions when interacting with others. During the analysis of data, the researcher continued to add to and correct the coding scheme according to emerging information about the intern's thinking and practice in relation to others and to institutions.

Findings and Discussion

The Multiple Tensions in Social Interactions with Others

This paper describes what kinds of multiple tensions Bernia paid special attention to in her professional relationships with others that influenced her science teaching. This study focuses on the major people who influenced Bernia's awareness of particular tensions. They are a university instructor, who taught Bernia's elementary science education methods class; a mentor teacher, who spent a year mentoring Bernia's internship experience; a field instructor, who visited Bernia's classroom to provide her with support and feedback; and, finally, her peers, who studied and worked together with Bernia in the teacher education program. In laying out these multiple tensions, this paper explores how those tensions occurred based on Bernia's personal point of view.

Tensions with a University Instructor in Her Science Education Methods Class

In general, Bernia valued the elementary science education methods class as being systematically organized around the various classroom activities delineated in the coursework syllabus; however, she was pretty skeptical about the ways in which the science methods class was conducted. She pointed out that the methods class was not significantly useful or productive for her actual teaching practice:

> I really enjoyed it. I always liked the class. But it has been a little frustrating. It was frustrating for me to see a huge agenda only accomplish two or three things. . . . I wish we had more time to talk with our groups.

Bernia felt overwhelmed by the methods class, for which a huge agenda and topics were planned for each class period. She was often disappointed because the class could not cover all of the topics as planned on the agenda. Bernia's disappointment about the methods class also had to do with her interaction with the university instructor, Patrick.

In general, Bernia liked Patrick's teaching methods and his way of helping interns in the science methods class:

> Patrick is great. I like that he is flexible and that if we bring something up, he will change what he planned and listen and discuss things with us. I like his teaching methods.

Bernia thought that Patrick taught the class in a very organized way and was trying to open the classroom discussion to everybody and that he always allowed the students to talk about their different opinions and ideas. She liked his ways of considering scientific investigation as an important inquiry skill, since she was also interested in helping kids do hands-on activities, like scientists who practice with questioning, finding evidence, observing, discussing based on data collected, and recording data. At the beginning of every class, Patrick handed out copies of the agenda to the students so that they knew what would be the main theme/activity for the class.

Bernia was not satisfied with what he brought to class and how he presented it, however. She was particularly dubious about whether all the topics Patrick brought up in class were really important to her future teaching practice:

> It is frustrating when he has all these plans and we don't do them all because sometimes I wonder if they were important and we should know the things he talks about.

She thought it was not realistic for them as interns to have so many topics at one class time because they had to skip a lot of issues and did not handle them well or in depth. Bernia believed that important topics were dealt with in superficial ways due to the constant time crunch. As a consequence, she did not want to pay careful attention to every topic or agenda offered by the teacher education class. Rather, she wanted to select particular things that she believed to be more important and valuable than others. For instance, Patrick believed that helping students to gain scientific understanding is essential to becoming a good science teacher. Thus, he emphasized that his interns do well on certain tasks such as pre- and post-assessment analysis. Bernia also agreed that there were some benefits to her in doing pre-assessment, saying, "The idea of having pre-assessment is so wonderful and so helpful and important for looking at students' misconceptions." Even so, Bernia revealed gigantic amounts of frustration and resistance to doing particular classroom tasks that Patrick assigned, including those related to pre-assessments. She was resistant to doing one of the main assignments on pre-assessments that included reporting and analyzing her students' misconceptions prior to her lead teaching. She had her own reasons why she hated to do it:

> Well, Patrick already knows how I feel about those. I despise the pre-assessments in the unit plans. I do not think that they helped me in any bit. . . . I know that we are learning and of course we are doing more work than a teacher would do. But the pre-assessment and the unit plan both took away my love for science that I was developing.

Bernia thought that even if she agreed that it is important for teachers to understand students' misconceptions, working on pre-assessment in great detail would be inappropriate for real classroom teachers. She believed that classroom teachers would be too busy to do that kind of "detailed, painstaking" task on a regular basis. Thus, she did not want to pay attention to the particular activity that Patrick assigned.

Bernia apparently had dilemmas about whether she really needed to study hard in the elementary science methods class, whose topics were not directly relevant to the present lead-teaching she was facing. In her mind, the class taught her unbeneficial and less than practical things, which were not helpful for her science lead-teaching:

> Friday mornings are hard. And I am very overwhelmed with my lead teaching. It is hard for me to sit and listen to someone else. I am frustrated because sometimes my mind is so focused on teaching plans and I have to go to class. We might spend almost [the] whole class talking about light and shadows, force and weather. And it is interesting to me. But I have so much to do with plans. I can't really sit and concentrate on something else.

Even though she attended the methods class regularly, Bernia confessed that she could not concentrate on the methods class because her mind was frequently going somewhere else—to her lead-teaching class. At a time when the methods class focused on topics different from the plants unit she was teaching, she felt it was irrelevant.

In summary, there were several reasons that Bernia perceived tensions produced by her teacher education methods class. She thought that the methods class was not very helpful or practical for her lead-teaching. She also thought that the class imposed too heavy of a workload on her, which was not realistic given science lead-teaching schedules. These things made her believe that the teacher education program was not realistic and practical because it was not supporting her internship well.

This is an important issue because there are many teacher candidates who believe that there are gaps and pitfalls between their teacher education programs and their field placement (Feiman-Nemser & Buchman, 1985). The teacher candidates tend to believe that all teacher education courses should be useful and helpful for them in a very practical manner. Thus, if they do not value a particular science methods course as helpful for their teaching, they will not become engaged with whatever the class offers. We can also assume that there are some gaps existing between teacher educators and teacher candidates in the sense that both of them might have somewhat different values about what is "really" important to focus on in their learning to teach elementary science and which topics they need to cover during methods class. These issues were similarly reflected in Bernia's ways of listening to and interacting with her mentor teacher.

Tensions with a Mentor Teacher

Bernia described her unexpected tensions with her mentor teacher, Helen. One tension had to do with the mentor teacher's didactic and authoritative ways of having her teach science. Bernia explained,

> I think I was extremely frustrated at the beginning before this plan was done. I think my case might be a little different because I was frustrated because I was told to teach the unit, and what was not helpful that she did was to tell me that I need to teach it the exact same way it was on there, . . . no intern should be expected to teach anything exactly how it's written because that's the opposite of what all Michigan State teachers do. They say, take a unit, get the students' ideas, and adapt it to your classroom. So, all of a sudden, I felt like I had all this; I did not want to teach it anymore. I did not know what to do.

Bernia was struggling with Helen's ways of dictating all her teaching activities and ideas. Through the academic year, however, she ended up just following Helen's requests and teaching methods, even though she did not like it. Bernia showed how deeply she was concerned with this tension. It has been emphasized that the partnership between interns and mentor teachers can provide richer, promising, more interesting, and more educative early field experience for elementary preservice teachers (Bullough et al., 2002). The mentor teacher has great influence on the student teacher's practice and growth. Bernia also seemed to acknowledge the immense influence of her mentor teacher on her science lead-teaching; however, she did not find Helen's involvement a useful and helpful

support for her teaching. Rather, she considered it a stressful and unpleasant experience.

Another tension came from Helen's ways of teaching and organizing science content for their second-grade students. Bernia thought that her mentor teacher taught science as an extension of teaching discipline to the students:

> I physically sat in a chair and observed (mentor teacher's teaching practice) two times. And one of them was a bad, bad experience, when she did a KWL. I was dying, and finally I shouldn't have, and I finally chimed in and I said, "Can you tell me more what you mean about that?" And she said, "This is not the time to ask for more comments." We are taking their ideas as they are, and you are not to interrupt me. And it was a horrible experience, but it was killing me to sit back and listen to them start an idea, and then never get pushed further. But that's, we got into a whole argument that day about how I don't know how KWLs are taught, and someone taught her this way, and so not to ever jump over that.

Bernia believed that science should not be taught that way to second graders; instead, science needs to be taught as a fun and exciting subject, rather than using didactical teaching methods with young learners. During her internship, therefore, Bernia did not agree with Helen's ways of teaching science at all. She thought that Helen's didactic teaching skills did not allow the students any space to investigate things with their own curiosity and excitement.

Interestingly, though, during her internship year, Bernia did not make her frustration and tensions with her mentor teacher apparent. Despite her formal and informal meetings with the researcher, she did not disclose those tensions to the researcher until the very end of the internship year. Her confession finally came through during the last interview after her internship year. In the dialogue below Bernia explained why she could not reveal her tensions to anybody and how difficult it was for her to speak up about them:

> And it was never taken, it was always up to me to say that, and I don't think many interns are going to say to their CTs (collaborating teachers), "I'm frustrated right now." And I have. . . . Most people feel comfortable to me and telling me how frustrated they are, so I know at least five or six that really wanted to say to their CTs they were frustrated, but they feel bad; they don't want to put . . . . [Student did not complete sentence.], and it was very frustrating for everybody.

Although she thought that Helen's way of teaching was absurd, Bernia did not even show or talk about her frustrations and disappointments directly to Helen at all. It is likely that critiquing her mentor teacher must have been a very sensitive issue for a teacher candidate placed in a mentor teacher's classroom.

Below is another example of problematic field experiences and increased tensions aggravated by the relationship with a field instructor.

Tensions with a Field Instructor

The role of field instructors in the teacher education program is to give the intern feedback through discussion in debriefing, along with the mentor teacher, when they visit the intern's classroom to watch their lead teaching. The important role of

field instructors in Bernia's teacher education program are twofold. First, their role is to help interns improve their teaching skills and strategies for effective teaching and learning of science. Second, they are to bridge some possible gaps between the candidate and mentor teacher in case there are communication problems.

Bernia raised the problem of having inefficient support in that the field instructor, Jane, was not qualified to support her science content specific teaching since Jane did not know anything about science and science teaching. Thus, Bernia believed that the field instructor did not play any helpful role for her teaching practice at all:

> Because Jane doesn't know any science, she was no help. She was pretty much calling us and asking us questions. She was horrible.

When the field instructor does not know about science and science teaching, then it is not feasible for the person to give any productive help to improve the intern's science content specific teaching. Especially in the elementary field, this reflects a severe difficulty in hiring and assigning field instructors to match with interns' subject-specific needs. This raises the question of what role the field instructor in elementary internship can take:

> Uh, I think she came three times, maybe four in the whole year. And two or three of those were all in one week.

With respect to the field instructor's other important role of facilitating a good relationship between the student teacher and the mentor teacher, Bernia could not receive support from the field instructor who rarely visited her science classroom over a school year. The field instructor came to her classroom a total of four times in the whole academic year; therefore, it was unlikely the field instructor would be aware of the fact that there were some problems in the relationship between Bernia and Helen during the internship.

As a consequence, during her internship year, Bernia believed that it was unlikely for her to expect any meaningful support from the field instructor for either resolving her tension with the mentor teacher or for improving her content-specific teaching skills.

Tensions with Peers

Another tension existed due to Bernia's perception of her colleagues as not being competent in their knowledge of elementary science or in making good plans of action for effective science teaching. This phenomenon was captured in her interactions with her methods classroom peers during the semester. At the beginning of the semester, Bernia was one of the most active students in class. She frequently interacted with other classroom peers in discussing and presenting important ideas, both in whole- and small-group discussions. She often added important issues and ideas to the class.

After several weeks, however, the situation became noticeably changed. Bernia started being less active and kept quieter in classroom discussions. Below is an example of Bernia's changed involvement in class. When the methods class was divided into small groups based on the interns' unit topics, Bernia's group of five interns was discussing the lessons about plants that they were supposed to teach in a few days. Even though the five members of Bernia's group were all supposed

to teach the Plants units, she evaluated the quality of their preparation as not the same as her own, saying, "They know less than I do about the unit." Bernia indicated that she could not get any support or help from her peers:

> Because we're all different grades and I'm really excited to see how it works in different grades, but at this point they know less than I do about the unit so I find myself being the leader. . . . I don't think I know that much myself, so it turns a little bit stressful because they are asking me what to do and I don't really want to tell them because I'm not sure if I'm right so . . .

She did not value the conversations that developed between her and other members of the group. Bernia thought that her peers did not know enough about the Plants units they were supposed to teach. As a result, she did not consider her relationships and interactions with them actually beneficial for her own upcoming teaching practice:

> It is a little frustrating for all of us, so they are taking what they want from the unit and building it into a plan of their own so it is not going to end up four people teaching it. It would be really neat if we were all teaching it the same way and getting feedback, but now I can hear how they are doing in there own way of teaching it, [yet] they are going to alter the plan, whereas I am going to follow it.

Bernia valued active communication among people and collaboration with those of similar teaching interests, since she took the stance that quality science teaching relies on active relationships among people. Unfortunately, however, Bernia did not trust her peers in terms of their science knowledge and teaching. Rather, she considered the opportunities to interact with others as a source of conflict, involving diverse ideas and the freedom to teach different things to students in various grades. As a consequence of her having involuntary and unsatisfactory communication with her peers, her desire to develop better teaching ideas could not be satisfied in collective ways with her peers. Her perceived tensions due to her mistrust of her peers contributed to the development of her idiosyncratic ways of teaching elementary science.

Negotiating the Tensions: Developing Idiosyncratic Ways of Teaching Elementary Science – Establishing a Teacher Identity

Given that Bernia had various tensions and multiple conflicts with others during her internship year, this study now describes how she as an elementary teacher candidate responded to and negotiated the tensions in learning to teach elementary science; it also examines the ways in which Bernia established her own science teacher identity as a result of the process of negotiation of the tensions in social relationships with others.

During the internship year, Bernia had to cope with multiple tensions. It turned out that she negotiated those tensions by developing her own ways of resolving them. Bernia tended to consider other people's support as less useful, beneficial, practical, and important for her teaching practice. She did not regard others as helpful supporters of her science teaching, but, rather, as tension creators who pulled her in opposite directions. As she expressed here, she rarely sought any significant support for her science teaching from other people such as her

university instructor, mentor teacher, field instructor, or peers. For instance, with respect to the relationship with her mentor teacher, Bernia said,

> I think it was, it was frustrating but I think . . . I liked it better when she wasn't in the classroom sometimes. She wasn't giving me very good comments, so why have her in the classroom? When she disciplines a kid, she yells out in the middle of the class. That was more destructive. [I]f she wasn't there, the kids were great. And if I . . . it seems like I'd rather not bug her. I think I learned so much more than if I would have had a CT that would've come along with me the whole way.

As a consequence of her ways of thinking about and resisting others, Bernia exhibited independent ways of preparing for and teaching her particular lessons. To prepare herself for lead-teaching in science, Bernia decided to rely less on others and more heavily on her own independent efforts and ability. Therefore, her overall ways of dealing with the tensions and moving along during her lead teaching seemed quite independent and often lonely. For example, when she had to prepare things for her science class, she did not seek for any help from her university instructor, mentor teacher, or her peers:

> And all that I had done was to take the video home, take notes on the video, and practiced once. I was not a pro. I had one zillion questions still laid out for me, but [when] I had those questions, I often went to the reading teacher, I got help, I came back, I asked if I could practice on a student, I did, and all of a sudden I was even better because I wasn't just saying I could do it. I was practicing it by myself.

Bernia did not get science subject-specific support from others in particular, but often took general help from nonscience majors such as the reading teacher. Bernia herself practiced for her science teaching and seemed to be satisfied with her independent ways of teaching science. Surprisingly, Bernia did not value the particular support system that was offered for her professional growth during her field placement. Bernia emphasized that she felt better at times when her mentor teacher was not deeply involved in her science teaching. She said that she would have already learned how to teach science that much without her mentor teacher's involvement in her teaching.

This study also uncovered that Bernia ended up following her personal values and beliefs in teaching science in negotiating the tensions and conflicts with others, instead of going along with others' suggestions. Bernia herself aspired to make a curricular and instructional decision based on her values and beliefs about whether particular teaching methods or resources could be useful and teachable. She relied heavily on her own values and beliefs, not on the university instructor's suggestions or requests. For instance, Bernia was reluctant to accept the university instructor's advice about how to fill out the unit plan for her teaching. Rather, she had a rationale about why she would not follow what the instructor asked her to do:

> Even with a unit plan, do they (ordinary teachers) write it like that? I feel like, as a teacher, just like taking on the Plant unit that everybody wrote, I had to translate it to help me be a teacher. So I don't think that format of a unit plan would even be the way you would write it! I feel like as a teacher, you

> would have to, of course, list the objectives; we all can do that. I think having us writing a few lesson plans with procedures on it would have been more applicable to us as teachers. Then activities by objective chart. The naïve goal of all that stuff seemed so technical and could have all been written up in a paragraph or something and been just as obvious . . . So I think I still don't feel like it was giving me practice in writing teachable units yet. You can't take that and teach it. It was more of a technical thing that I feel like a researcher might do or something. And not a teacher . . . so that is why it was frustrating.

In addition, Bernia did not value filling out lesson plans in the ways the instructor proposed. She thought that listing learning objectives in the lesson plan and matching them with the benchmarks was redundant for her teaching practice. The lesson plan was supposed to include a description of the state and national benchmarks as delineated by Project 2061. She regarded writing lesson plans as more of a technically procedural thing, rather than a part of a useful and teachable teaching activity. Furthermore, for bernia, writing a lesson plan like that was not an important job of real schoolteachers, but a product of university researchers. That was her rationale for why she was not following the instructor's guidelines for making a lesson plan.

Interestingly, despite particular tensions, frustrations, and conflicts with others, Bernia put in a significant amount of strenuous effort to improve her own science teaching and to become a good science teacher to help students learn science well. She said that she had improved her perception of science and science teaching practice due to her own efforts, through working with her students, asking and answering some scientific questions, and increasing her own intrinsic motivation to learn science by her own:

> And all of that, and just like what I've learned with students, by creating questions . . . I then was motivated to learn more, and that was the first time in my life, in the middle of the semester of my senior year, that I actually, on my own, wanted to learn about science. And it was all because I had asked myself questions. And there was a purpose. I really wanted to know those answers. And before, I don't think they were ever provided to me in a way that the answers were going to make any difference.

According to Bernia, she developed her own individual ways of enjoying science, but help from others did not contribute to growing her interest and motivation to become a good science learner in order to teach science well. Although Bernia had taken several science content classes and an elementary methods class, she did not attribute to them her increased motivation to learn/teach science or her improved teaching practice. Considering that she rarely valued others' ways of teaching science or their suggestions for her science teaching, her aspiration for being independent of others in teaching science ended up being way of negotiating the tensions with others who she thought held less than useful resources for the professional growth she valued. During the internship year, however, Bernia did not reveal her resistance to others and rarely brought it to the attention of others. She seemingly followed others' suggestions, got along with them well, and did not reveal any problems in relationships with others, but it turned out that she completely resisted by opposing the suggestions she considered as unhelpful. It was apparent that the possibility of improving her relationships with others was unlikely in Bernia's case.

Conclusions and Implications for Teacher Education

This study explores what kinds of tensions an elementary science teacher candidate paid special attention to in the process of interacting with others to learn to teach elementary science during the internship year. The tensions with a teacher educator had to do with the intern's different values and beliefs about the usefulness of the teacher education program. Since Bernia believed that taking teacher education courses and working on the assignments were not useful, nor fruitful for her teaching practice, she resisted the teacher educator's advice to complete certain tasks. The tensions with her mentor teacher were largely to do with Bernia's evaluation that the mentor teacher was not a good and effective science teacher. Given her values and beliefs about what needs to be focused on in elementary science in order to make science fun and exciting, her mentor teacher's traditional and didactic ways of teaching science did not serve Bernia well as a model for being a beginning elementary teacher. Rather, the situation permitted Bernia to enjoy being independent, creating and developing her own ways of teaching science, and disagreeing with her mentor teacher's support/comments/input during her lead teaching. The tensions with Bernia's field instructor had to do with the fact that Bernia did not get science content-specific support. Since Bernia believed that the field instructor was less knowledgeable and unable to provide her with help for science teaching, she did not seem willing to trust the field instructor's general feedback either. The tensions with her peers had to do with Bernia's belief that they were not working hard enough to do a good job of teaching science. Her evaluation of her peers was that they knew less about science content than she did, and they also did not prepare well for their lead teaching. Due to these perceptions about her peers, she felt that she did not have to interact with other students about science teaching anymore.

This study also highlights the particular ways in which the teacher candidate develops her own social aspect of identity through negotiating the tensions generated from her social relationships with the various people in meeting their expectations. Bernia tended to consider other people's involvement as less useful or helpful. Due to her reluctance to accept other people's suggestions, she was unable to use their involvement in her teaching as an intern. As a consequence, she ended up taking the stance of resistance to other people's varied approaches to teaching elementary science. With the multiple tensions she faced and perceived, Bernia chose a way of using her own personal values and beliefs to resolve the tensions by frequently either neglecting or resisting others' expectations. The holding of different values and beliefs seemed to create difficulties in nurturing effective communication among the people around the beginning teacher.

In particular, the results of this study permit us to reexamine Helms' (1998) conceptual framework that explicates the process of developing a "science teacher self" for framing the image of what science teaching should be. The framework is quite useful in the sense that we can think about the various ways in which an individual teacher interacts with other dimensions of shaping an image of a science teacher. The dimensions are the teacher's values/beliefs, institutional/cultural/social expectations, actions, and future self. Among the four dimensions, in this study, the individual teacher's values and beliefs turned out to take the most important role by far in shaping her science teacher self and constructing the image of what science teaching looks like. For instance, Bernia tended to critically evaluate whether others' involvement in her science teaching could be useful to improve her own teaching practice. She filtered other people's influence on

her teaching through her own personal values and beliefs. This type of filtering system influenced her critical decisions about whether she would take others' input, suggestions, ideas, and teaching methods, all of which are likely to reflect their institutional/cultural/social expectations.

The findings in this study indicate that teachers' values and beliefs are the central component of developing habits of minds for good science teaching, and they tend to filter others' expectations and affect teachers' actions and arbitrary decisions on the curricular and instructional events and shape their future teacher image. As Kennedy (1999) and Lortie (1975) suggested, teachers' values and beliefs could possibly be formulated and developed through those prior personal experiences of what school science looks like, how students are supposed to learn and perform, and how teachers are supposed to teach.

We do face a challenge in that values and beliefs are extremely difficult to change or be reshaped by others during the relatively short time span of a teacher education program. Teachers are highly likely to maintain their own teaching style that derives from the way their own frame of reference leads (Kennedy, 1999). Given the fact that it is hard to change the frame of reference that a teacher has long developed, as teacher educators we need to be aware of the challenging task of influencing the individual teacher's values and beliefs on science teaching.

This study highlights the central role of teacher education to help beginning elementary teachers become successful science teachers. A good starting point would be that, as teacher educators, we first need to make the effort to better understand the tensions, difficulties, and frustrations that the prospective teachers experience. It especially draws our attention to the need to help teacher candidates realize what can be most valuable to pursue in elementary science teaching and to help improve and change their ways of science teaching in an effort to modify their frame of reference toward more effective science teaching so that the teacher candidates see new perspectives and teaching methods offered by others as useful, productive, and helpful for reform-based science teaching. At the same time, though, it is also equally important to help teacher candidates develop an appropriate ability to evaluate and critique the professional resources and others' suggestions for making effective instructional and curricular decisions in teaching practice. Thus, as teacher educators, we ought to prepare the available route and space for teacher candidates to reconsider or correct their frames of reference, relearn science and science teaching, and develop better pedagogical skills for successful science teaching.

Notes

The findings and discussions in this study relied heavily on the intern's personal reports and descriptions of her perceptions and feelings toward the teacher education program and other people. This contributes to the limitations of the study. Mainly relying on the data of an intern's personal description and perception, this study does not completely lay out the whole picture of how the intern actually did and finally gained from her interaction with other people in her learning trajectory. Thus, I acknowledge that her negative comments and perceptions do not necessarily mean that the teacher education program, university instructors, mentor teachers, field instructors, and other interns are doing less than a successful and effective job in teacher education, as Bernia seemed to perceive in this study.

References

Abell, S. K. (2000). From professor to colleague: Creating a professional identity as collaborator in elementary science. *Journal of Research in Science Teaching*, *37*(6), 548-562.

Beijaard, D., Verloop, N., & Vermunt, J. D. (2000). Teachers' perceptions of professional identity: An exploratory study from a personal knowledge perspective. *Teaching and Teacher Education*, *16*(7), 749-764.

Bolam, R. (1987). Induction of beginning teachers. In M. J. Dunkin (Ed.), *The international encyclopedia of teaching and teacher education* (pp. 745-757). Oxford, UK: Pergamon.

Bullough, R. V., Young, J., Erickson, L., Birrell, J. R., Clark, D. C., Egan, M. W., Berrie, C. F., Hales, V., & Smith, G. (2002). Rethinking field experience: Partnership teaching versus single placement teaching. *Journal of Teacher Education*, *53*(1), 68-80.

DeCorse, C. J. B., & Vogtle, S. P. (1997). In a complex voice: The contradictions of male elementary teachers' career choice and professional identity. *Journal of Teacher Education*, *48*(1), 37-46.

Erickson, F. (1986). Qualitative methods in research on teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.). New York: Macmillan.

Feiman-Nemser, S., & Buchman, M. (1985). Pitfalls of experience in teacher preparation. *Teachers College Record*, *87*(1), 53-65.

Freppon, P. A., & MacGillivary, L. (1996). Imagining self as teacher: Preservice teachers' creations of personal profiles of themselves as first-year teachers. *Teacher Education Quarterly*, *23*(2), 19-33.

Helms, J. V. (1998). Science—and me: Subject matter and identity in secondary school science teachers. *Journal of Research in Science Teaching*, *35*(7), 811-834.

Jackson, Y. A. (2001). Multiple Annies: Feminist poststructural theory and the making of a teacher. *Journal of Teacher Education*, *52*(5), 386-397.

Katz, L. G., & Raths, J. (1992). Six dilemmas in teacher education. *Journal of Teacher Education*, *43*, 376-385.

Kennedy, M. M. (1991). Some surprising findings on how teachers learn to teach. *Educational Leadership*, *49*(3), 14-17.

Kennedy, M. M. (1999). The role of preservice teacher education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 54-85). San Francisco: Jossey-Bass.

Lampert, M. (1985). How do teachers manage to teach? Perspectives on problems in practice. *Harvard Educational Review*, *55*, 178-194.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lortie, D. C. (1975). *Schoolteacher: A sociological study*. Chicago: University of Chicago Press.

Ryan, K. (1986). *The induction of new teachers*. Bloomington, IN: Phi Delta Kappa Educational Foundation.

Sarbin, T. R., & Scheibe, K. E. (1983). A model of social identity. In. T. R. Sarbin & K. E. Scheibe (Eds.), *Studies in social identity* (pp. 5-28). New York: Praeger.

Spindler, G., & Spindler, L. (1992). Cultural process and ethnography: An anthropological perspective. In M. D. LeCompte, W. L. Millroy, & J. Preissle (Eds.), *The handbook of qualitative research in education* (pp. 53-92). London: Academic Press.

Tierney, W. G. (1993). Self and identity in a postmodern world: A life story. In D. McLauglin & W. G. Tierney (Eds.), *Naming silenced lives: Personal narratives and processes of educational change* (pp. 119-134). New York: Routledge.
Volkmann, M, J., & Anderson, M. A. (1998). Creating professional identity: Dilemmas and metaphors of a first-year chemistry teacher. *Science Education*, *82*(3), 293-310.

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Manuscript accepted July 14, 2004.