PAACE Journal of Lifelong Learning, **Vol. 18, 2009, xx-xx.**

Refereed Article

Digging Deep: Understanding the Practice of Mentoring Prospective Science Teachers in an Urban School Context in Jordan

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Abstract

This study sought to understand the practice of mentoring prospective science teachers in an urban school context in Jordan. A qualitative research approach was utilized to answer the research questions. Data were derived from participant interviews and classroom observations. The needed data were gathered from two mentors and two mentees. Results provided evidence that the practice of mentoring prospective science teachers has many contradictions that prevent science novices from having a successful mentoring experience. The study suggests that providing mentees with the needed support in certain areas (e.g. classroom management) is essential to resolve some of their contradictions. Moreover, that support should accompany a fine training of their mentors on ways to mentor science novices. Finally, the study recommended preparing a special training course for mentors on how to do mentoring, where the university's preservice teachers office as well as the school district's professional development office could work together to prepare such a course.

Introduction

School systems worldwide are experiencing an overwhelming need for new teachers. This is due to increasing teacher retirements, state mandates for lower class sizes, and teacher attrition that is the highest during the first three years of teaching (Evertson & Smithey, 2000). Teaching

*Information from Author's Statement will go here.

has incredible demands, especially for novice teachers (Brock & Grady, 1998; Fuller, 1969). According to Breeding and Whitworth (1999) the experience of the novice teacher is a stressful one. Loaded with classroom discipline problems, novice teachers often regress to more rigid teaching methodologies (Brock & Grady, 1998). According to Veenman (1984), although teachers are idealistic, progressive, and liberal in their attitudes during their preservice life, 70 percent of them shifted their teaching to more traditional teaching methodologies such as lecture, with classroom discipline problems, completing their paperwork, the expectations of the principal, time management, and planning daily instruction identified as significantly influencing their altered teaching style.

Novice teachers in their beginning teaching stage need a lot of assistance. Nevertheless, the culture of schools is isolationist, with teachers working in separate classrooms. One promising practice to meet novice teacher needs is mentoring, where an expert teacher helps the novice teacher (Ballantyne & Hansford, 1995; Corley, 1998; Feiman-Nemser, 1996; Ganser, 1992; Huling-Austin, Odell, Ishler, Kay, & Edelfelt, 1990; Little, 1990). The heart of mentoring is the mentor/mentee relationship (Gray & Gray, 1985). Factors impacting the success of this relationship, and therefore the success of the novice teacher, include the school environment, the mentoring program itself, and the characteristics of the participants.

Tauer (1996) studied the relationships between mentor and mentee in the school setting. Tauer examined perceptions of 10 pairs of mentor/mentee relationships using a case study methodology. Her research included multiple interviews during the year, observations in the work place, and attendance at mentor meetings. Tauer found that the novice teacher/mentor relationship was very "idiosyncratic" and unpredictable in its nature, and that the context of the relationship was extremely important in shaping its dimensions. Tauer identified three key contextual variables: (a) the personalities of the participants, (b) the structure of the mentor program itself, and (c) the community, district, and school environment.

While the importance of the mentor/mentee relationship is well-documented in the literature, the nature of that relationship in the school setting is not well-developed. A survey of the current literature (both locally and internationally) indicates that very little research describes what happens to teachers mentoring teachers and, specifically, experienced teachers mentoring novices. Research has uncovered many variables that impact the mentoring process. Furthermore, the literature

shows that these variables lie in three major domains: mentor program variables (Evertson & Smithey, 2000; Ganser, 2000), school environment variables (Brock & Grady, 1998; Tauer, 1996), and participant profile variables (Freiberg, Zhibowski, & Ganser, 1996).

That said, it becomes apparent that there is a need for additional research in the area of mentoring novice teachers. The need is especially imperative in Jordanian context as most universities in Jordan are restructuring their preservice teacher mentoring programs. Furthermore, the study is urgently needed, as there is little in the literature concerning the preparation of Jordanian novice science teachers (Qablan, 2006). Moreover, qualitative studies that investigate the topic in depth are essential to capture the full picture of the various influences that affect the preparation of Jordanian novices. However, addressing the deficiency in the research can not be complete without considering the multiple facets and elements involved in preparing science teachers (e.g. teacher beliefs and knowledge of teaching practices, cultural expectations and norms, and the tools available for such work). Thus, this study is intended to answer the following questions: What is the nature of the novice science teacher mentor/mentee relationship in a large school context in Jordan? What forces affect this relationship? How do the forces affect this relationship? What forms of "guidance" and "support" do mentor teachers offer novice science teachers?

To address these exploratory and descriptive research questions, we employed cultural historical activity theory (CHAT), a theory that examines multiple contextual elements involved in the activity of mentoring prospective science teachers.

Cultural Historical Activity Theory

We selected CHAT as the theoretical lens, as it has the capability to enable researchers to consider the multiple facets and elements that interact with the studied social phenomena. The CHAT frame requires a serious consideration of the structural, cultural, and historical features that shape teaching. Another important aspect of CHAT is its focus on the analysis of contradictions in the system—features within a system that clash (Roth, et al., 2002). Given its emphasis on contradictions, we argue that CHAT helps to illuminate the facets that allow for or inhibit the activity of mentoring prospective science teachers during critical stages of their preparation.

CHAT stems in part from Vygotsky's (1978) theory of mediated activity which describes all purposeful human activity as accomplished through the use of physical and/or psychological tools. The use of these tools can only be understood within its sociocultural and historical context. Engeström (1987) produced a diagram of the activity system (Figure 1) in which the triangle in the upper half of the figure depicts the relationship between subject and object as mediated by cultural tools.

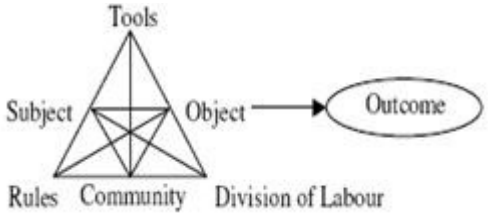

Figure 1.

The Activity System

This upper triangle describes individual learning with relations between the subject, object, and mediational artifacts. The lower half of the diagram shows that individual learning is mediated not only by cultural tools, but also by the community of practice, communal rules and divisions of labor.

Engeström (1999) also distinguishes between the object of an activity and its outcome. The object is not momentary, but it is broader than what individual actions would accomplish. Individuals can have objects toward which they move with individual actions, but the outcome is something that all individuals accomplish in their collective activity.

The concept of contradiction is an important part in CHAT. A contradiction is a conflict or clash within components of the activity system that prevents attainment of the object or outcome of that system. By identifying contradictions in an activity, we can identify areas where improvements can be made. Contradictions can limit or alter an activity, thus, addressing these contradictions can enhance the activity system. As a result, contradictions can be seen a driving force for change and development within a given system.

Engeström (1999) identifies two continuously operating processes in the activity system: internalization and externalization, which together form an expansive cycle for that system. The expansive cycle can lead to the transformation of a system, in which contradictions are limited and the system more effectively results in the desired outcome. In the

expansive cycle, the subject of the activity first internalizes the existing structure of the activity. Afterward, if critical self-reflection occurs, the subject may make alternations to the system to reduce contradictions. This process of modification is the externalization component of the expansive cycle. Any system that does not externalize its emerging contradictions will stay inside a non-expansive cycle and reproduce the existing culture, supporting the status quo.

In this study, Figure 2 represents the activity system of mentoring prospective Jordanian science teachers. It includes the consideration of subjects in both the classroom and the larger social, political, and educational contexts. This research reports on the nature of personal and contextual contradictions facing science mentors and mentees while conducting their mentoring activity.

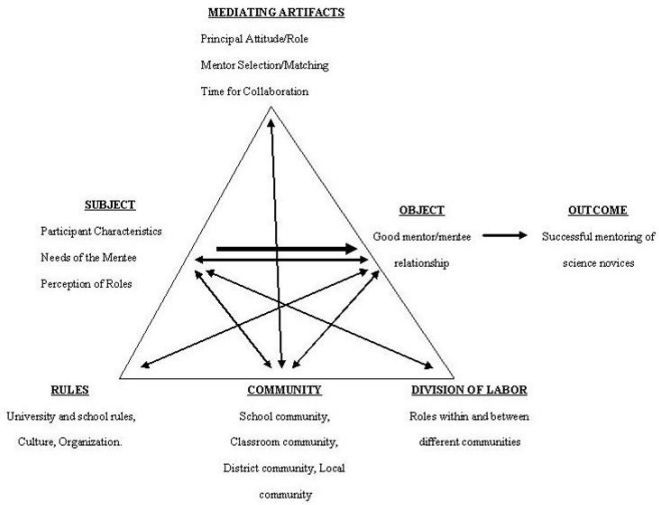

Figure 2.

Mentoring Activity System of Science Novices

In the figure above, the subjects of the activity system at the center of this study will be two pairs of science mentors and mentees who participated in the mentoring program of the Department of Curriculum and Instruction at the Hashemite University in Jordan. It includes the participants' characteristics, the needs of the mentee, the mentors' perception of their role, the mentors' supervisory skills, the benefits to the mentor/mentee, and their respective conflict resolution skills. The communities

of the activity system involve their classroom communities, university community, district community, and local community. The mediating artifacts would include the school principals' attitude/role, mentor selection/matching, time for collaboration, school proximity, and resources. The objects would be the good mentor/mentee relationship and the outcomes would represent the successful mentoring of science novices.

Methodology

The purpose of this study was to explore the nature of the practice of mentoring between novice science teachers and mentors in a large urban school. The goal was to gain an in-depth understanding of mentoring novice science teachers in the context of the school (Patton, 1985) and to gain an understanding of the meaning that novice science teachers had constructed within that context (Glesne, 1999). Because it best answers the questions of what and how, qualitative research was chosen as the methodology for this study. Taylor and Bogdan (1998) described the uniqueness of qualitative research as a pathway to understanding interactions in their context.

Design and Methods

The research design for this study was a cross-case analysis of two pairs of novice science teachers and their mentors at the elementary level. Each mentor/mentee pair was considered as a single case with similarities and differences explored across all cases. Multiple case designs have distinct advantages and are often considered more compelling (Yin, 1994). Merriam (1998) argues that case study's interest in "process rather than outcome, in context rather than on specific variables, in discovery rather than confirmation made this a valuable method to answer the research questions" (p. 60). A case study is concrete and contextual, taking a holistic view of the situation (Merriam, 1998). For this reason, it enabled examination of the many emerging variables that affected the mentor/mentee relationship.

In this study, the main source of data derived from a series of in-depth interviews with the selected participants; in addition, several classroom observations were used to better understand the nature of the mentorship practice of the participants in this study.

In an attempt to understand the practice of mentoring prospective science teachers of this study, more attention was paid to understand

the various personal and contextual (i.e., cultural, historical, communal) elements that surround science novices in their classrooms. However, in analyzing the data, researchers paid particular attention to how participants in this study viewed the tensions and inconsistencies that inhibited their progress.

Context

This study took place in Jordan, a small country situated at the junction of the Levantine and Arabian areas of the Middle East. Jordan is bordered on the north by Syria, to the east by Iraq, and by Saudi Arabia on the east and south. To the west is Israel and the occupied West Bank. Jordan occupies an area of approximately 96,188 square kilometers including the Dead Sea, making it similar in size to Austria or Portugal.

This study was carried out in a large, urban women's school in the city of Zarqa, the second largest city in Jordan (after the capital city of Amman). The school houses more than 1000 students and 60 teachers. Due to its good reputation in the community, this school was chosen by the university office of preservice teacher programs to host training for prospective teachers. During the fall semester of the 2005-2006 academic year, twelve science novices were practicing in that school. These participants were senior science education students in the Department of Curriculum and Instruction at the Hashemite University, Jordan. Senior science education students at this university are required to intern for one academic semester in selected public schools to practice their teaching. During their practicing period, they work with both mentors and university supervisors to advance their teaching experience, dealing with various real classroom issues. While mentors are supposed to guide mentees at these local schools, university faculty members make several supervisory visits to help them advance their teaching skills.

Research Participants

Participants in this study were two pairs of science mentor/mentees who were given the following pseudonyms; Elham/Maysa and Itaf/Lana. These participants were part of the school system mentoring program for novice teachers. Each pair consisted of a novice science teacher with no experience and an experienced science teacher assigned to work with the novice. The two pairs were housed within the same school. Sampling was conducted in a "purposeful" (Patton, 1990) fashion in order to study

information-rich cases in depth. The purposeful sampling targeted outstanding mentors with prior experience in order to identify best practices in mentoring. Each mentor had more than ten years of experience in teaching general science to seventh and eighth graders. Under the supervision of their mentors, novices were trained for one full academic semester to teach science for these grades.

Data Collection

Multiple data collection methods were employed in this study. The primary method was participant interviews that revolved around the nature of the relationship between science mentors and mentees; the cultural, social, and historical influences that interfered with that relationship; the problems faced during their mentoring period; and the suitable solutions for these problems. Interviews were conducted with both mentors and mentees and recorded and transcribed verbatim for analysis. In addition to participant interviews, several classroom observations of mentors and mentees were conducted to better describe the elements that surrounded their interactions and the way these elements shaped their relationship. According to Bogdan and Biklen (1998), participant observation consists of in-depth and intensive observation of the activities, people and physical aspects of the situation being studied.

Data Analysis

Data collected in this study were categorized using the six elements of CHAT; subject, object, outcome, mediating artifacts, rules, community, and division of labor (see Figures 1 and 2). All data within a category were searched for emergent themes that provided provisional information as to relationships among and within the data (Coffey & Atkinson, 1996). That process helped in building connections among the extracted themes, establishing relevant relationships and connections (Miles & Huberman, 2002).

As in any qualitative study, rigor is a major factor that shapes data analysis. To ensure the rigor of the findings in this study, researchers followed Patton's (1990) strategy of triangulation. Patton (1990) recommends considering multiple data sources to support proposed themes. In addition, CHAT itself ensures triangulation by requiring the examination of many facets of a broader activity.

Member checking was another strategy that the researchers used to

ensure the rigor of their findings (Glesne, 1999). To do so, the researchers shared the tentative results of their data analysis with three of their colleagues to ensure that the data were analyzed correctly.

Since the language of all collected data was Arabic, all excerpts used in the following case studies were translated into English (Sperber, Devellis, & Boehlecke, 1994) by three bilingual faculty members from the College of Educational Sciences at the Hashemite University. Furthermore, to confirm that the translation process was accurate and reflected the interviewees' meanings, each participant was given her written case study and feedback was considered in correcting any comment from the participants.

Results

Case 1- Elham and Maysa

Elham is a science teacher who has been teaching children for 13 years, four years of which were spent in her current school. Throughout her years of teaching experience, Elham served as a mentor for seven mentees from the Hashemite University and other universities in Jordan.

Beliefs about mentoring. To Elham, the first experience in mentoring was a distinguished experience—an experience that she still remembers vividly despite her mentoring of many students afterward. When asked to talk about that experience, Elham mentioned that her first student (mentee) was a lady from the city of Amman, who, in Elham's point of view, was the worst mentee that she has ever seen. When asked to elaborate more on that negative experience, she mentioned, "My first mentoring experience was really bad… The student that I was mentoring was careless … I especially did not like her way of dressing… She used to come to school in unacceptable clothes, with deep lip colors and exaggerated use of perfume."

Regardless of that bad experience, Elham continued to mentor students; indeed, she mentioned many reasons to do mentoring. One of these reasons was the new pedagogical knowledge that she learned from her mentees. She said, "I do mentoring to many students in order to learn new pedagogical strategies and implement them in my classroom. I honestly am not up-to-date with all these new teaching strategies; therefore, I try to learn them from my mentees."

In addition to that important reason, Elham continued to mentor

many students in order to receive help from them. She said, "I like to mentor many students because I learn from my students. I also receive help in carrying out my work like correcting exams, and taking over my teaching responsibilities during my absence."

Nevertheless, Elham does not benefit from all of her mentees, since some of them require careful mentoring and long practice periods to do the job nicely. She mentioned:

"My students differ from each other, some of them learn quickly while others do not. They significantly differ in their passion to teach and that all depends on their foremost decision to be teachers, as some of them study teaching due to family demands."

Due to these variances in students, Elham has developed features of the students that she likes to mentor, one of which is a sufficient knowledge of pedagogy. She said, "I think students should have certain characteristics to be able to undertake their teaching job. One of these characteristics is to have sufficient pedagogical knowledge as well as knowledge in using various instructional materials that aid students' learning."

However, from Elham's perspective, above all these criteria, the passion to learn how to teach is the most important. "The most important feature that any mentee should have is the love to teach students."

Style of mentoring. Mentoring is a demanding job, as it requires careful attention from the mentor to teach the mentee how to carry out the job and handle classroom issues; therefore, Elham pays a lot of attention to her students from the beginning of her mentoring project. "Once I get assigned to mentor a student, I meet with her and introduce myself to her in order to get to know each other before we start our work. I believe that mentoring requires careful attention as you know some students needs special teaching strategies and ways of treatment."

Elham's care to offer students special attention stems from her belief that any neglect of a student in the classroom would have negative effects on other students.

"I believe that a mentee should behave correctly with her students," she says, "as any misbehavior from a mentee would have negative consequences on the learning atmosphere inside the classroom. Therefore, I encourage my mentees to develop their skills in managing the classroom and especially troublesome students to minimize any negative effects that may result."

The mentor (Elham) and mentee (Maysa). At the time of this study, Maysa, Elham's mentee, was a senior undergraduate student who was bilingual in both Arabic and English. As she mentioned in one of her interviews, she chose to enter the science education program to realize her dream to be a successful science teacher for children. "I entered the science education program to be a successful teacher in the future because I love teaching."

With respect to the type of relationship between mentor and mentee, Elham tried to build a friendly relationship with her mentee, Maysa. She (Elham) believes that any successful mentoring requires a friendly relationship between the mentor and mentee. When asked to describe the nature of the relationship that she built with Maysa, Elham said "I guess that we treated Maysa as a sister. Maysa was an open minded mentee, she accepted my criticism that I did for her and considered them fruitful for her endeavor of learning how to teach."

Maysa was pleased about the friendly relationship and appreciated Elham's guidance and support. "I am very thankful for my mentor for her good relationship with me. Throughout the semester, she was very helpful and supportive to me."

Maysa was also happy with Elham for giving her the chance to teach in her absence. "I am very happy that my mentor gives me the chance to learn how to teach and how to handle the classroom issues wisely."

Despite that happiness, Maysa faced some contradictions throughout her training period. One of these contradictions originated from the division of labor node in her activity triangle (See Figure 3 in the discussion section below). In that contradiction, Maysa did not like the way her mentor split the job between her and her mentor. As Maysa mentioned, her mentor put the whole responsibility of teaching on her and that caused a discomfort for Maysa as she was facing problems in managing students inside the classroom. "Although I like to teach," Maysa said, "I would like my mentor to stay with me while I am teaching in order to help me manage the classroom wisely, since the students do not consider me their permanent teacher."

Another contradiction that arose from the division of labor node of Maysa's activity triangle was the use of classroom time. Maysa complained about the way her mentor used classroom time. According to Maysa, her mentor dedicated the last 20 minutes of each classroom session to correct exams and to do other unrelated work.

"I did not like the way my mentor used the classroom time. My

mentor intends to use the last 20 minutes of each classroom meeting to correct her exams and register her grades."

These contradictions made Maysa unhappy, as she was expecting to receive more help and guidance from her mentor throughout her training experience.

Case 2- Etaf and Lana

Etaf is a science teacher who was born in the city of Tafeleh, Jordan but moved to the city of Zarqa about ten years ago. At the time of this study, Etaf was in her 13th year of teaching science to students. Throughout her last three years of experience, Etaf served as a mentor for six mentees from the Hashemite University.

Beliefs about mentoring. To Etaf, the first experience in mentoring was a very positive in that she loved her mentee who did the work perfectly. The mentee ultimately received the highest score from both Etaf and from the school's principal. "My first experience was a lovely experience that I still remember," she says. "My first mentor was a bright student who was excellent in her work and made everybody (students, myself, and our school's principal) happy."

Quite the opposite of that positive experience, Etaf also has had a negative one. When asked to explain that experience, she mentioned "My worst mentoring experience was with a married mentee who had a family and one little kid. Her familial responsibilities deviated her from doing her job correctly… she even was not ready for her final evaluation at the end of the semester."

Regardless of the sort of experience that she may face, Etaf has several reasons to do mentoring. One of these reasons is her interest to learn from new students. "I like to mentor new students because I like to learn from them the new strategies of teaching and learning. For example, I greatly learned from my current mentee, Lana. She brought to my classroom new teaching ideas and used a variety of teaching materials. That is in addition to engaging students in the lesson, which made them love to learn."

Additionally, Etaf liked to mentor students as they helped her in emergency cases—especially during sickness or when she is not ready to teach. "I also like to mentor students because they substitute for me in the case of emergency, like during my sickness or during the time that

I don't feel like teaching."

However, Etaf sometimes does not like mentoring as she believes it makes her students confused about the role of their permanent teacher and that of the mentee.

I sometimes do not like mentoring because I do not like to confuse my students, since you know… we teach in different ways."

Style of mentoring. According to Etaf, mentoring appears to be a stressing job for her especially at the beginning of the mentoring project. "At the beginning, I feel scared from mentoring students, but right after I get to know my mentee and love her, I get encouraged to work with her to improve my teaching skills."

Etaf's feeling appears to originate from her beliefs about the practice of mentoring itself. When she was asked to describe the causes of her fear, she mentioned "I honestly believe that mentoring is a huge responsibility on the shoulders of the mentor. Once my principal assigns a mentee to me, I plan to give her everything that I know about teaching. In addition, I feel like mentoring may confuse students and make them lost between me and my mentee." When asked to describe the way she eliminates that fear, she said "Once I get assigned to mentor a student, I meet with her and introduce myself to her in order to get to know each other before we start our work. I try to build a strong relationship between myself and my mentee and to continue our relationship even after we finish the semester. I think that this way helps me reduce any risk and confusion that we may cause to my students."

Etaf likes her mentees to be open-minded and accept her critiques. She also likes to collaborate with her mentees for the benefit of both of them. "I like my mentee to be open-minded and accept my criticism in order to develop her teaching skills" she said. "I think we should consider ourselves friends in order to benefit from each other."

The mentor (Etaf) and mentee (Lana). At the time of this study, Lana, Elham's mentee, was a senior undergraduate student who was very excited to teach at the school. That excitement was noticed as she was bringing most of her teaching materials from home and from outside in order to give her students a better understanding of the scientific principles.

Similar to Maysa's case, Lana had a very good relationship with her mentor (Etaf). As she mentioned in one of her interviews, her men-

tor was very helpful and supportive. "My mentor was very helpful and supportive. She gives me the chance to teach and implement the way of teaching that I like, not only that but she was excited to learn from the teaching strategies that I use."

Lana was pleased with that sort of relationship and appreciated Etaf's trust.

"I am lucky to have such a mentor. I am very thankful to her for being a very good friend."

Despite that happiness, Lana experienced some contradictions throughout her training period. One of these contradictions originated from the community node in her activity triangle (See Figure 3 in the discussion section below). To explain that contradiction, Lana mentioned that she did not like the way that other teachers at the school commented on her teaching style. "I did not like the comments of other teachers on my teaching style" she stated. "They were demanding me to teach using their way, like covering 10 pages per a session and they were telling me that you should not implement everything you learned at the university because it does not work here."

The second contradiction for Lana arose from her subject node in her activity triangle. Etaf, her mentor, did not stay with her inside the classroom while teaching, causing Lana to be worried. Therefore, Lana wanted her mentor to be with her all the time in order to learn from her valuable experience. "As you know, I am still learning how to teach, I was looking to have my mentor with me all the time in order to learn from her long experience. I believe that I could have learned from my mistakes if she was assessing me regularly.

These contradictions made Lana quite concerned and worried, as she was expecting to receive more help and guidance from her mentor throughout her training experience.

Discussion

The aforementioned cases reveal a rich experience of mentoring with several contradictions shared among participants in this study: contradictions between subject and object, between community and object, between mediating artifacts and object, and between division of labor and object (see Figure 3 below). These contradictions (indicated as broken arrows in the figure) shaped the type of mentoring that participants in this study received. In fact, some of these contradictions were strong enough to alter participants' behavior (e.g. classroom management), re-

sulting in a partial achievement of the object of their activity system. However, the attainment of the original object—that of having a successful mentoring experience—would require transformation in the context of these participants. The analysis of the contradictions in their systems is an important step in allowing for such transformation.

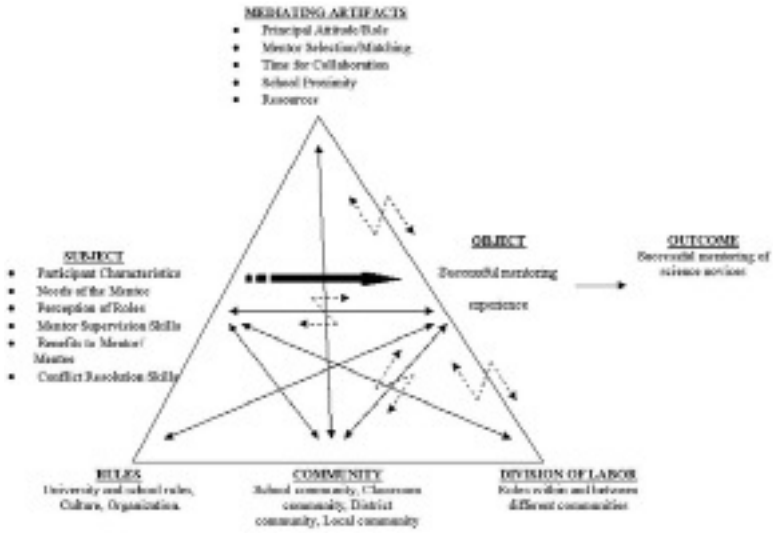

Figure 3.

Internship Activity triangle of Science Novices (contradictions shown in broken arrows)

Although these contradictions altered the achievement of the preset object of these participants, that object was reformulated to fit their imbalances in their context. Indeed, this is not surprising as the continuous reformulation of the object is a normal response to the imbalances and contradictions that the subject sees in the system (Engeström & Miettinen, 1999; Kärkkäinen, 1999). If these contradictions were not addressed through some means of transformation, then the system may become non-expansive and lead to the reproduction of the same unsuccessful mentoring in the future.

According to the literature of CHAT, in any activity system, subjects can respond to their contradictions in their systems by either changing the elements of their systems that produce the contradictions or accommodating the contradictions and changing or reformulating their object to make it more attainable. The subjects in this study accommodated

their contradictions and reformulated their object of having a successful mentoring experience.

According to Kärkkäinen (1999), object reformulation can occur in four ways: widening, narrowing, switching, and disintegrating. Widening of the object relates to the object expansion while narrowing refers to object contraction. Switching involves a shifting of the object in response to tensions in the system, and disintegrating refers to the fragmenting or splitting of the object. In this study, the reformulation of the object resulted in narrowing it (having a partially successful mentoring experience), a reformulation that Engeström (1987) called non-expansive.

However, it is important to note that narrowing the object for these participants occurred due to their inability to totally challenge their contradictions. In fact, this inability could be dangerous in the sense that these novices may reach a burnout stage (Haberman, 1991) and stop challenging their contradictions if these contradictions exceed their tolerance limit.

Thus, if we are to move toward helping these and other science novices to have successful mentoring experiences, resolving the contradictions identified in this study appears to be crucial (Brickhouse & Kittleson, 2006). The following section discusses ways to resolve these contradictions.

Resolving the Contradictions

The literature indicates that there are several constraints that face novice science teachers. During their early days in school, classroom discipline and management and insufficient instructional materials are the primary difficulties faced by novice teachers (Fuller, 1969; Veenman, 1984). Participants in this study addressed similar concerns. "Although I like to teach," said Maysa, "I would like my mentor to stay with me while I am teaching in order to help me manage the classroom wisely, since the students do not consider me their permanent teacher."

Lana noted that "The materials that I use in my teaching differ from class to class. I need various types of instructional materials to pursue my teaching the way I like. The problem is I don't find all these materials at school. I have to bring them with me from home which is far away from the school."

Little and Nelson (1990) insist that novices need special help to manage their classrooms. They indicate that this help should be offered by

their mentors since mentoring is more than passing on a "bag of tricks." Mentors must be able to describe and demonstrate underlying principles of teaching and learning such as handling and managing classrooms (Little & Nelson, 1990).

Furthermore, many researchers (Huling-Austin, Odell, Ishler, & Edelfelt, 1989; Odell, 1987; Veenman, 1984) emphasize the necessity of training novices on classroom management strategies during their early days at school. That conclusion was derived from a U.S. survey conducted in Virginia in 2000 (cited in Smith, 2003).

The results of that survey showed that over 90 percent of beginning teachers indicated classroom management was a serious problem for them, and 80-90 percent rated their mentors as important sources of support in handling their classrooms.

In addition to these contradictions, some participants in this study complained about the culture of their schools. "I did not like the comments of other teachers on my teaching style" said Lana. "They were demanding me to teach using their way, like covering 10 pages per a session and they were telling me that I should not implement everything I learned at the university because it does not work here." The traditional culture at Lana's school did not foster her progress toward implementing her pedagogical knowledge. That lack of constructive collaboration from her collegial community inside the school stood as an obstacle on her way to improve and use her new pedagogical knowledge.

It is important to note that establishing a supportive collegial community inside the school has concerned many researchers. For example, Feiman-Nemser (1996) documented discussions among teacher colleagues and found a lack of dialogue regarding problems in their classrooms. This norm discourages the beginning teacher from seeking help and the veteran teacher from assisting. In addition, Little (1990) described a school culture that greatly prevents a beginning teacher from requesting help and constrains mentor teachers from giving assistance.

In discussing the nature of the contradictions that face mentors and mentees, the need for strategies to alleviate these concerns appears crucial. Since the nature of mentor and mentee concerns seems to be quite similar, many researchers suggest ways to facilitate the practice of mentoring of novice teachers. Some researchers (Little & Nelson, 1990) argue that because the work of mentoring differs from the work of class-

room teaching, it is thought to require new and different skills. Mentors need preparation in ways to help novices handle their typical problems, including "classroom management, basic lesson design and delivery, evaluating student progress" (Little & Nelson, 1990, p. 2). They also need to learn how to talk clearly and straightforwardly about teaching without offending the mentee (Little & Nelson, 1990).

A plausible suggestion to prepare mentors for their work is to offer a training course that introduces mentors to their new role and provides skills and strategies that they can use in their work. The training connects views about teaching and learning to teach with specific procedures and techniques that can be used in face-to-face, close-to-the-classroom work. A manual to such a training course seems to be of great importance and could contain information on all the domains of mentoring. District professionals and university educators can work together to prepare a good handbook to train mentors.

Little and Nelson's Leader's Guide (1990) outlines the components of such a training course. It contains the following dimensions: Orientation to the Mentor Role, Assisting the Beginning Teacher, Classroom Organization and Management for New Teachers, Classroom Consultation, Observation and Coaching, Mentor as Staff Developer, and Cooperation Between the Administrator and Mentor. Each section in this guide contains specific training segments with activities, handouts, and directions for how teachers can practice particular skills in their school.

In addition to training mentors, schools where mentors work should reduce part of their mentors' work load in order to ease their mentoring job. In doing so, mentors would have sufficient time to guide their mentees, reflect on their growth, and monitor their progress.

A possible sponsor for these suggestions could be the university internship office or the colleges of education at national universities. These stakeholders need to work hard and hand-in-hand with district professional development offices to design a training manual for mentors in order to ensure the quality of science teacher graduates.

Implications for Practice

This study has provided evidence that the practice of mentoring science novices has many contradictions that impede the creation of successful mentoring experiences. There are several considerations that need to be taken by mentoring program stakeholders to guarantee the success of their programs. The findings of this study suggest training

collaborative teachers on ways to do mentoring before allowing them to mentor novices. University preservice teacher offices as well as district professional development offices need to work together to prepare such a training course in order to ensure the quality of their novice science teachers.

However, giving a training course for mentors does not seem to be enough. Offering continuous support and systematic follow-up to improve mentors' abilities is essential to facilitate the growth of novice teachers. If mentors, who are considered master teachers, need continuous training and support, it would seem that all novices would benefit from the same. The typical training course for mentors does little to promote systematic reform in science education. For real change to occur, systematic workshops focused on improving teaching need to be followed by support and continued feedback to build and sustain authentic change in science education.

Additionally, this study recommends that schools and universities work collaboratively to come up with a list of requirements that cooperating teachers should meet before allowing them to mentor novices. A screening committee could be formed that incorporates equal participation of all parties in the mentoring process, including novices who have completed their field experience. This could, of course, create delicate situations in which colleagues are forced to confront the shortcomings of fellow teachers. There is no simple formula for the screening process, but obviously more information from all parties will increase the likelihood that mentors will be both well-qualified and successful.

Creating a list of recommendations is a much simpler task than finding ways to implement them. Change in mentors without accompanying structural changes in their mentoring environment is doomed to long-term failure. However, implementation of the above-mentioned recommendations can help the stakeholders of mentoring programs to better serve their novices.

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