

NEGOTIATING THE MENTOR PROTÉGÉ RELATIONSHIP: WHAT CAN BE
LEARNED FROM THE EXPERIENCE?

by

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(Under the Direction of Thomas R. Koballa, Jr.)

ABSTRACT

This study explored the relationship of two mentor-protégé pairs within the internship component of an alternative certification program in secondary science. I collected data using interviews and participant observations during one school year. Four research questions guided the study: 1) What is the nature of the advice given by a science mentor? 2) What do the mentor and protégé each gain from the relationship? 3) What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them? 4) How does the relationship change over the period of the study?

Using the frameworks of narrative analysis and analysis of narratives, I analyzed the data and developed cases detailing the experiences of each pair. These cases were then compared for similarities and differences with respect to the participants' experiences.

Themes present included advice given by both mentors within the domains of general pedagogical knowledge and pedagogical content knowledge. Both protégés believed they had expanded their views of science teaching. Tensions for both mentors and protégés centered on the themes of expectations versus realities, approaches to

teaching, and lack of communication. Three of the four participants experienced a similar cycle in their feelings about their relationships which began with optimism, followed by increasing levels of tensions. One pair was able to resolve their tension and end the relationship on a positive note, the other pair was not.

The findings of the relationship highlight the need for changes to mentor training programs and the development of authentic cases to be used with mentors and protégés.

INDEX WORDS: Alternative Certification, Narrative, Mentor-Protégé Relationships, Science Teacher Education, Pedagogical Content Knowledge, Tension, Advice, Fieldwork, Internship

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DEDICATION

My dissertation is dedicated to my grandmothers Vivian Felton and Hazel Upson. As far back as I can remember, they have stressed to me the importance of getting an education and being able to take care of myself. The world I live in now is different than the one they experienced, and they have inspired me as I pursued opportunities unavailable to them. I feel fortunate to have a close relationship with both of these strong women and have been molded by the influence and accomplishments of both.

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CHAPTER 1

INTRODUCTION

“It was a good experience overall. I think that anything that happens in your life you can learn things from, and I’ve learned a lot.”

Jodi, 04/30/03

Jodi’s statement, made during her final interview at the end of a year-long internship in an experienced science teacher’s classroom mirrors much of the literature on mentoring. Jodi’s feelings are generally positive, but do not provide detail as to the nature of her experience. We can use the analogy of looking at a picture of a tropical rainforest taken from a plane flying high above to compare Jodi’s assertion and much of the literature pertaining to mentoring to the objectives of this study. The canopy of the rainforest looks lush and inviting when viewed from the distance. The smooth surface as seen from the air reveals little of the underlying complexity. It is only when one leaves the safety of the plane and enters the forest on foot that the complicated interactions and intricacies of the forest begin to reveal themselves to the worthy explorer. Just as the rainforest provides the opportunity for in-depth study to unravel its secrets, so too does the relationship between a mentor and protégé. This study explores the complex relationships that evolved for two pairs of mentors and protégés completing a year-long science teaching internship in an alternative teacher certification program.

My own interest in the phenomenon of mentoring was sparked by two issues, my experience as a novice science teacher working with a mentor, and a research project I completed as part of my doctoral work. In my situation as a novice teacher, I was assigned a mentor from a

different subject area; she provided me with emotional support and made a few visits to my classroom. While I appreciated her interest and time, I did not feel that I learned many valuable lessons about science teaching from the relationship. My second motivation for exploring mentoring relationships originated in my pilot study research. As I interviewed five people enrolled in an alternative certification program about their experiences, four of the five mentioned the important influence of their mentor teachers. From the perspective of study participants, these people had been an invaluable part of their teacher education. Much like the introductory quotation from Jodi, the sentiments they expressed were positive, but vague. I became interested in probing beneath the surface of these relationships to learn more about the complexities I knew to be involved.

From this introduction of my own path into the forest of this research project, I turn now to an overview of the literature that informs the study. Much as explorers in a habitat would study the fieldnotes of those who had been before, familiarizing myself with works already published in the areas of mentoring and alternative certification enlightens my own foray into a new territory.

Mentoring

Mentoring of novice teachers has been touted as a way to reduce attrition and ease the transition shock experienced by those who enter the profession (Danielson, 1999; Lortie, 1975; Veenman, 1984). Mentors can assist protégés by providing emotional support and an introduction to the culture of a particular school or department (Carter & Francis, 2001; Gold, 1996; Wang, 2001). While these aspects of the social health of the protégé are important, mentors can provide additional guidance in the protégé's development as a teacher; they may

furnish direction as novices struggle to find appropriate teaching resources and develop their pedagogical content knowledge (Gold, 1996; L. Shulman, 1986).

Assistance provided by mentors can occur at several different points in the budding careers of novice teachers. Mentors may work with new teachers who have obtained their first teaching position, or they can play a role during the field experience component of a teacher education program. Within the specific context of a field experience internship, the beliefs and school experiences that novices bring to the relationship can have a significant impact on what is learned (Cole & Knowles, 1993; McIntyre, Bird, & Foxx, 1996). Findings related to the influence that mentors have on the development of the protégé is mixed – some studies find the mentors have significant influence, others find minimal sway exerted by these teacher educators (Borko & Mayfield, 1995; McIntyre et al., 1996). One possibility for the discrepancy may be the confusion about roles that occurs in some mentor-protégé pairs (Huling-Austin, 1990; Klug & Salzman, 1991). When partners are uncertain about expectations for what their actual function should be, a morass may develop where protégés feel they learn little from the relationship.

Though mentoring is pervasive in the field of education today, its roots are found in the business community (Merriam, 1983). In the years since mentoring has become a fixture in education, there have been changes and expansions to the concept. In the original interpretation, mentors were seen primarily as buddies whose main purpose was to ease the transition shock of novices (Danielson, 1999). With a growing understanding of the complexities involved with learning to teach, and an emphasis on reflection in the education literature, a new term, “educative mentoring” has been coined to name this expanded view (Feiman-Nemser, 2001). Proponents of this idea believe the role of the mentor is to help the protégé develop an “inquiring stance” towards their practice. Mentors with this philosophy help new teachers develop long

term goals for professional development, and then support novices as they work towards those goals (Feiman-Nemser).

Though ideas about mentoring have changed and expanded, many of the constraints facing those who participate in mentoring relationships have not. Some researchers in the field have expressed concern that by placing such a strong emphasis on the master-apprentice model, mentoring relationships have served to replicate unambitious, teacher-centered practices (Ballantyne et al., 1995; Emmer, 1986; Evertson & Smithey, 2000; Gratch, 1998; Grossman, 1992; Kennedy, 1991; Wang, 2001). Additionally, the independent and isolationist culture of schools can thwart attempts to develop collaborative discussions about teachers' work (Ballantyne, Hansford, & Packer, 1995; Gratch, 1998; Kay, 1990). Lack of available time in busy teachers' schedules can serve as a barrier to maximizing the potential of mentoring relationships (Gold, 1996; Smith, 1993).

Research discussed in the preceding paragraphs was based largely on studies that were not content specific in nature. Science-specific literature related to mentoring relationships is sparse. Literature found in this area often involves a description of a specific program, rather than an empirical study. As with other mentoring literature, some of the studies highlight the various roles that mentors can take on in their work with protégés (Roberson, Smithey, & Evertson, 1997). Comparing the experiences of novices who had no mentor, those who were assigned a mentor outside of their discipline, and those involved in a science-specific mentoring program, Luft, Roehrig, and Patterson (2003) outlined the benefits of a science-specific support system.

Literature in the area of mentoring focuses on the various benefits that can accrue as the result of mentoring relationships. Support systems for novices to help ease their entry into the

profession are an oft-cited boon. Since the inception of mentoring in teacher education, thoughts about the responsibilities of the mentor have expanded to encompass an understanding of the role that places more emphasis on reflection. While there can be many positive gains for mentors and protégés, certain constraints exerted by school culture can minimize the effectiveness of these relationships. A review of the literature reveals that few studies of mentoring are content-specific in nature.

Because mentors and protégés participating in the study were participants in an alternative certification program, a second body of literature informing the study is that pertaining to alternative certification. The following section highlights some of the debates present in that field.

Alternative Certification

Because of the high demand for and perceived shortage of teachers, there has been recent growth in the number of alternative certification programs (Berry, 2001; Chesley, Wood, & Zepeda, 1997; Darling-Hammond, 1990; Dill, 1996; Feistritzer, 1994; Jelmberg, 1996; Stevens & Dial, 1993). These programs vary widely in requirements for completion, though most require some education course work along with a supervised field experience supported by a mentor teacher (Dill, 1996). Because of the wide variety in program requirements, comparison of the effectiveness of these programs is difficult (Berry, 2001).

Much controversy surrounds alternative certification programs. Proponents of alternative certification state that graduates of these programs are as effective, or more effective than traditionally-certified teachers (Dill, 1996; Houston, Marshall, & McDavid, 1993; Hutton, Lutz, & Williamson, 1990; McKibben, 1988; Stevens & Dial, 1993). While critics claim that teachers educated in alternative programs are less prepared than their traditionally-certified counterparts

(Berry, 2001; Darling-Hammond, 1990). Thus far, the literature reveals little consensus on the success of alternative certification programs.

Though the debate continues, aspects other than teacher effectiveness are considered. One of the benefits of alternative certification programs is that they tend to attract under-represented groups such as minorities and men into the profession, however, concerns remain (Chesley et al., 1997; Feistritzer, 1993; Feistritzer, 1994; Hutton, Lutz, & Williamson, 1990; Kirby, Darling-Hammond, & Hudson, 1989; Shen, 1997; Zumwalt, 1996). Critics argue that alternative certification completers lack a commitment to the profession, are not fully competent in their content knowledge, and are often assigned to schools where disadvantaged students need the most qualified teachers (Dill, 1996; Feistritzer, 1993; Stevens & Dial, 1993; Stoddart, 1993).

Because so many alternative programs rely heavily on field experiences, the work of mentors becomes extremely important (Chesley et al., 1997; Dill, 1996). Just as traditionally-certified teachers experience surprise at the realities of the profession, so too do those completing alternative programs. In some cases due to the prolonged absence from schools of students in alternative certification programs, their shock may be even greater (Eifler & Potthoff, 1998). Mentors provide a vital support system that can help alternatively-certified teachers transition from their previous careers into teaching by providing emotional support as well as the wisdom of their expertise.

A third component of the literature that guides this study is research pertaining to the theoretical frameworks. In this study, those frameworks are situated learning, border crossing, and teacher development.

Theoretical Frameworks

The term theoretical framework has many definitions in the field of education. For purposes of this discussion, Merriam's (1998) view that the theoretical framework represents the frame and scaffolding for the study will be used. The ideas presented in the three frameworks will provide a guide for organizing and interpreting the data gathered.

The central tenet of situated learning is the notion that learning is a social process of meaning construction that is specifically linked to the context in which it occurs (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Rogoff, 1990). Newcomers learn the norms and activities of a new community by gradually assuming more of the responsibilities associated with that group (Lave & Wenger, 1991). In this study, novices learn to become part of the profession of teaching with the guidance of their more experienced mentors. What protégés learn during the process is dependent on the situation in which they find themselves, and their relationship with their mentors.

The other two aspects of the theoretical framework are intertwined with the idea of situated learning. Border crossing occurs as people enter a new community and must learn its culture (Aikenhead, 1998). These alternatively-certified science teachers leave the culture of their previous careers and enter that of schools and teaching. The mentor can serve as a guide to ease this transition and help the novice adjust to their new environment. As new teachers cross the border into their new career of teaching, there is much for them to learn. Expertise in the areas of pedagogical knowledge, subject matter knowledge, and pedagogical content knowledge are necessary for those entering the teaching profession whether through traditional or alternative routes (Borko & Putnam, 1996). Again, mentors can provide support as well as the benefit of knowledge and experience for new teachers trying to become competent in these domains.

The brief overview provided by the summaries of these theoretical frameworks helps focus attention on the possible mechanisms and areas where mentors can provide guidance to their protégés. These frameworks provide a theoretical scaffolding that encompasses an idealized realm of possibilities. One of the goals of the study is to articulate how these theoretical ideals are enacted within the complexities of real mentoring relationships. Another body of literature integral to this research is that pertaining to the methodological frameworks that guide the study.

Methodological Frameworks

Any forest explorer would carefully select and pack the tools needed to record her visit and share her findings with those unable to accompany her. In the case of a naturalist studying the forest, these tools may include cameras for taking photographs and video; supplies for collecting and preserving specimens; and notebooks for recording ideas, observations, and impressions. As the explorer experiences the forest first-hand, she must be mindful of the format she will use to share her findings with others who have similar interests. The necessities for an educational researcher are similar. In the case of this study, the tools used included tape recorders for preserving interviews; notebooks and pencils for recording observations; artifacts collected on classroom visits; and the recollections and impressions of the researcher.

The overarching goal of this research project was to capture the experiences of the four participants as their mentoring relationships developed, and to gain some understanding of what each learned from the endeavor. Keeping this endpoint in mind, I chose a narrative approach as the guiding methodological framework for the study. Data collected from the two mentor-protégé pairs were used to generate a case for each pair that was a compilation of their experiences. These cases include first person stories of their experience. The narratives are grouped thematically within the research questions that they answer.

Bruner (1986) first articulated the idea of narrative ways of knowing; he defined narrative knowing as the ways of thinking used to deal with human actions and intentions. Building on Bruner's work, Polkinghorne (1995) developed two constructs, narrative analysis and analysis of narratives. In narrative analysis, data consist of actions and events, and the analysis produces stories. This framework was used in the study to compile data from interviews and fieldnotes into first person accounts used to share the experiences of each of the participants (Gudmundsdottir, 2001). Because teachers' knowledge is thought to be structured in the form of stories, narratives provide an apt vehicle for sharing their experiences (Carter, 1993). Analysis of narratives is an analytical approach used to thematically group the stories told by participants (Polkinghorne, 1995). This approach was used to determine the stories to be told and to arrange them in a way that would facilitate comparison of the participants' experiences with respect to each research question.

Tying together what was learned from my own experiences with mentoring and a review of the literature, I developed a rationale, statement of purpose, and research questions that would guide my exploration of mentoring relationships. Without that focus, it would be easy to become hopelessly lost during the journey that was this research project. Those guiding principles are outlined in the following section.

Rationale and Purpose

While there is a large body of research that supports mentoring as a way to help with new teacher induction, much of it is found in position papers (Danielson, 1999; Howey, 1988; Huling-Austin, 1992). These papers advocate the importance of mentors to the development of novice teachers, but they are brief summaries of literature or statements of opinion rather than empirical studies. Other literature pertaining to mentoring concerns the evaluation of selected

mentoring programs (Klug & Salzman, 1991; Manley, Siudzinski, & Varah; 1989). These studies highlight the importance of training for mentors and the necessity for a formalized relationship between mentor and protégé.

The empirical studies that do exist related to the success of mentoring relationships most often rely on questionnaires and interviews that are used to collect information as the formal mentoring process nears completion or has already ended (Gehrke & Kay, 1984; Odell, 1986; Smith, 1993; Wildman et al., 1992). The outcomes of these studies are categories of the types of assistance that mentors provide to new teachers. While these studies are helpful in providing an overview of the mentoring experience, they do not provide a detailed picture of what actually occurs in the relationships. These projects provide lists of areas where mentors provide advice, but little is known about the nature of that advice. Because the studies are based on questionnaires and interviews, they lack the added dimension of observational data, elaboration, and reflection (Gehrke & Kay, 1984; Klug & Salzman, 1991; Odell, 1986; Smith, 1993; Wildman, et al., 1992). Few of the studies that do exist focus on content-specific mentoring relationships (Robeson, Smithy, and Evertson, 1997; Wang, 2001). Given the importance of the development of pedagogical content knowledge for new teachers, it is important to have studies that focus on mentoring within specific content disciplines.

In addition to a better understanding of what occurs in mentoring relationships, information about the experiences of teachers who enter the profession through alternative routes is important. More people are entering through these pathways and the quality of the support that they receive in schools is a critical aspect of their success (Chesley, Wood, & Zepeda, 1997). Chesley (1995) finds that because of their diverse and varied experiences, the support that they need may be different than that of traditionally-certified teachers. Because mentoring frequently

plays a large role in alternative certification programs, it is important to cultivate an understanding of the influence of those relationships within alternative certification programs. Empirical research that lends greater insight into the needs and experiences of alternatively-certified teachers can inform those developing programs to certify and support them.

In summary, mentor studies thus far provide a useful basis for beginning to unravel the complexities of mentoring relationships, but there is little empirical research that involves an analysis of the development of the relationships between mentors and their protégés and how these complex relationships evolve and are negotiated (Feiman-Nemser, 2001). Additionally, there is little mentoring literature that is specific to the development of science teachers and the role that mentors may play in helping protégés develop their pedagogical content knowledge. Because mentoring frequently plays a large role in alternative certification programs, it is important to cultivate an understanding of the influence of those relationships within alternative certification programs.

The purpose of this research was to examine the relationships between mentors and protégés within the context of an alternative certification program. Research focused on how the relationship between the mentor and protégé developed over the course of the internship and the type of learning about teaching that occurred in the interactions between participants.

Specifically, the research questions that guided this study were:

- 1) What is the nature of the advice and guidance given by a science teacher mentor?
- 2) What do the mentor and protégé each gain from the relationship?
- 3) What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them?
- 4) How does the relationship change over the period of the study?

Summary and Preview

This chapter has provided an introduction to the study and a synopsis of the literature informing it. The rationale, purpose, and research questions were articulated. Chapter Two furnishes a summary of pertinent literature in the areas of mentoring and alternative certification. An expanded review of literature related to the theoretical frameworks of situated learning, border crossing, and teacher development is also included in Chapter Two. An explanation of the methodology and methodological frameworks, a description of researcher subjectivities, and narrative portraits of the participants is found in Chapter Three. Chapters Four and Five contain the cases for the two mentoring pairs who participated in the study. These chapters are organized according to the four research questions and highlight the narratives constructed for each mentoring pair. A cross-case analysis comparing the similarities and differences between the two mentoring pairs comprises Chapter Six. A summary of the conclusions and implications for research and practice concludes the work in Chapter Seven.

CHAPTER 2

REVIEW OF THE LITERATURE

Several bodies of literature inform this study. The first is literature focusing on mentoring within the context of learning to teach and new teacher induction. Areas highlighted include: the rationale and impetus for the use of mentors in new teacher induction; the types of support that mentors provide and the part they play in new teacher induction; the role of mentors in the field experiences of pre-service teachers; the ways in which views regarding mentoring have changed over time; literature related specifically to mentoring and science education; and the limitations and constraints on mentoring relationships. Because the focus of this study is protégés in an alternative certification program, a second important area is literature relating to that topic. Areas highlighted cover: a definition and description of alternative certification; a review of the effectiveness of teachers trained in alternative certification programs; a discussion of perceived benefits of and concerns about alternative certification; and an examination of the role that mentors play in alternative certification programs. The chapter will conclude with an elucidation of the theoretical frameworks used to guide the study. The three principle underpinnings are situated learning, border crossing, and new teacher development.

Mentoring

The term mentor has its beginnings in the Greek story of Odysseus who entrusted Mentor with the care and upbringing of his son Telemachus. The relationship between the mentor and protégé was close and respectful, with each partner playing different roles. Mentor was required to use wisdom and integrity in his guidance of Telemachus, and Telemachus, the protégé, was

expected to learn from his advisor and to respect differences in their maturity and experience (Little, 1990). From this beginning in the literature of ancient Greece, mentors have appeared in a variety of settings including the areas of adult growth and development, business, and education (Merriam, 1983).

Rationale and impetus for new teacher mentoring. One of the reasons that mentoring is used to support beginning teachers is the belief that the assistance of a mentor can reduce the attrition rate of new teachers. Studies show that as many as forty to fifty percent of new teachers will leave the profession within the first seven years (Gordon & Maxey, 2000). While there are a myriad of explanations for why beginning teachers leave, one of the most often cited reasons is the isolation and lack of support they receive in the school setting (Boreen, Johnson, Niday, & Potts, 2000; Gold, 1996). When new teachers feel isolated, they can develop feelings of loneliness and become discouraged, leading eventually to burnout and an abandonment of teaching as a career (Gold, 1996). The support of a mentor teacher can affect new teachers' decisions to remain in the profession as they grapple with the difficulties of their new career (Evertson & Smithey, 2000; Gold, 1996; Odell & Ferraro, 1992). In one study of new teacher retention, Manley, Siudzinski, & Varah (1989) determined that being part of an induction program with a strong mentoring component affected the retention rate of new teachers with seventy-five percent of those surveyed planning to remain in teaching for five years or more, compared to twenty-five percent of the group who did not have mentoring assistance. New teachers who experience a supportive environment and beneficial interactions with colleagues, such as mentors are less likely to leave (Gold, 1996).

A second area where mentors can help new teachers is coping with the "transition shock" they experience as they move into a position as a practicing classroom teacher (Danielson, 1999;

Lortie, 1975; Veenman, 1984). Among the problems novices face are emotional dilemmas, lack of contextual knowledge, and a discrepancy between their images of good teaching and what they are able to enact in their classrooms (Wang & Odell, 2002). Beginning teachers have concerns about discipline, lesson and curricular planning, location of resources, and student assessment that they feel under-prepared to handle based on their pre-service experiences alone (Howey, 1988; Odell, 1987; Veenman, 1984). New teachers can be unrealistically optimistic about what they will be able to accomplish and become quickly discouraged as they face unexpected barriers (Huling-Austin, 1992; Klug & Salzman, 1991). Traditional norms encouraging isolation and self-sufficiency can make new teachers reluctant to ask for help (Danielson, 1999). These novices may feel overwhelmed and frustrated as they wrestle with the complexities of their new profession, mentor teachers can assist novices as they negotiate the transition from college or previous careers into classroom teaching.

Types of support provided by mentoring relationships. There are a variety of roles and support that mentors can offer in their relationships with protégés. Words that have been used to describe the role of the mentor include: coach, confidant, teacher, parent figure, role model, counselor, and sponsor (Abell et al., 1995; Anderson & Shannon, 1988; Ganser, 1998; Gehrke & Kay, 1984; Howey, 1988; Little, 1990). Within the context of these roles, mentors provide emotional support, socialize novices to the culture of schools, provide assistance with the development of pedagogical content knowledge, and model continued professional growth.

Novice teachers are confronted with many challenges as they enter the profession; a mentor can provide emotional support as novices cope with the transition shock and stress associated with their new profession (Carter & Francis, 2001; Gold, 1996; Huffman & Leak, 1986; Little, 1990; Smith, 1993). Using survey data collected from teachers four years into their

careers, Odell and Ferraro (1992) found that the emotional support was what was most valued in mentor-protégé relationships. Mentor teachers provide novices with someone to talk to about a variety of issues (Abell et al., 1995; Wildman, et al., 1992). The emotional support provided by conversations with mentor teachers addresses one of the most pressing needs of beginners (Ballantyne, Hansford, & Packer, 1995; Hargreaves & Fullan, 2000). This emotional support may involve confidence and self-esteem building, empathetic listening, and ideas for stress management (Gold, 1996). Novice teachers may feel like failures because they are unable to live up to unrealistic expectations they have set for themselves; mentors can help combat these feelings of failure and boost the self-confidence of the novice (Abell et al., 1995). The emotional support provided by mentors is seen as one way to lower new teacher attrition (Wang & Odell, 2002).

Mentors can play an important role in socializing new teachers into the culture of individual schools and the teaching profession (Wang, 2001). Mentors assist new teachers as they develop an understanding of the professional culture of the teachers in a school and interact with other teachers and school administrators (Carter & Francis, 2001; Odell, 1986; Odell, 1990). This assistance can include information about school routines, policies and procedures, and the particular content required by the school district (Ballantyne et al., 1995; Huffman & Leak, 1986; Huling-Austin, 1986; Odell, 1986). This important socialization role is yet another form of support that mentors can provide for novice teachers.

In addition to the personal support mentors provide, they also offer professional assistance. Novice teachers may have a well-developed understanding of the content they are to teach, however, they do not have the experience and knowledge to translate that into lessons that are effective at ensuring student understanding of the topic; mentors help as novices begin to

develop their pedagogical content knowledge (Gold, 1996; L. Shulman, 1986). Because of the focus on specific teaching practices, mentoring relationships in which this type of assistance is provided are most effective when the mentor and protégé teach the same subject and grade level (Abell et al., 1995; Huffman & Leak, 1986; Odell, 1990).

As part of this developing professional knowledge, mentors help new teachers gather materials and resources to use with students, and assist as they develop strategies for teaching specific content (Huffman & Leak, 1986; Odell, 1986; Wildman et al., 1992). Topics of assistance can include: strategies for introducing certain topics, pacing of lessons, and reinforcement of difficult concepts (Huling-Austin, 1990). Drawing on a study of 23 mentor teachers, Wang (2001) found that teachers in the United States and their protégés discussed curricular and pedagogical issues, as well as the emotional needs of the novice teachers. In a study that involved interview data from 46 mentor and novice teachers, Abell et al. (1995) found that protégés learned a variety information from their mentors, “They got ideas, materials, advice, and insight into students...; they learned tried and true techniques, and management and control skills; and they learned how to solve problems” (p. 184). In addition to emotional support and introduction to school culture, mentors can work with novices to improve their teaching practice by sharing information about a variety of resources and teaching strategies.

Mentors and protégés have conversations about the problems new teachers face and mentors may provide specific advice and suggestions for how to solve them (Ballantyne et al., 1995; Evertson & Smithey, 2000; Ganser, 1998). As the protégé brings specific questions, mentors draw on their store of practical knowledge as well as a differing perspective to help protégés develop solutions (Howey, 1988; Huling-Austin, 1990; Odell, 1990). In a study conducted by Wildman et al. (1992), the mentors’ intention in helping protégés solve problems

was to save the protégé time or keep them from making a serious mistake. One specific area of problem-solving necessary for new teachers is management of the classroom (Veenman, 1984). Mentors assist new teachers as they develop routines and procedures to minimize management disruptions (Evertson & Smithey, 2000; Huffman & Leak, 1986). Yet another important function for mentors is to provide ideas that help novices solve the problems they encounter in their own classrooms.

Relationships with mentors and the models they provide can serve as the basis for the continued professional development of novice teachers (Ganser, 1998; Gratch, 1998; Wang, 2001). In a study of the experiences of new teachers, Gehrke and Kay (1984) found that one third of the new teachers they surveyed believed that having a mentor was important to the development of their career. It is during the first few years of practice that the impressions and attitudes that new teachers bring to the profession become crystallized; left with little to no support and overwhelming demands, new teachers can develop practices that do not support the current push for standards-based teacher education (Gold, 1996; Wang & Odell, 2002). With no support, novices can implement survival strategies that may not be beneficial for students, but that become a permanent part of their teaching style (Huling-Austin, 1986; Varah, Theune, & Parker, 1986). Mentors help protégés with solutions to immediate dilemmas they face in their classrooms while encouraging novices to develop long term visions and goals for themselves as teachers (Feiman-Nemser, 2001; Stanulis, 1994). Mentors help reduce the isolation that new teachers feel, as well as serving as role models to promote the idea that learning to teach is a continual process that occurs over the course of a career (Carter & Francis, 2001; Odell, 1990). Novices who spend their entire workday in isolation from other new teachers and more experienced counterparts reduce their opportunities to learn about the profession (Huling-Austin,

1986). Providing feedback and helping new teachers critically reflect on their practice can be a part of mentoring relationships (Ballantyne et al., 1995). In addition to helping new teachers develop the disposition to reflect on their practice, the mentoring relationship may also facilitate reflection and professional growth on the part of the mentor (Abell et al. 1995; Carter & Francis, 2001; Feiman-Nemser, 2001; Ganser, 1998; Huling-Austin, 1990; Stanulis, 1995; Wildman et al., 1992).

While the degree of influence that mentors have in relationships with protégés varies based on the individual circumstances of the pair, mentors can provide assistance in several areas including both personal and professional development. This support can be crucial to the survival and professional growth of the protégé. Though mentor-protégé relationships can be beneficial, the amount of influence mentors and protégés exert on each other is dependent on the type of relationship they develop.

Mentoring in field experiences. As novice teachers reflect on their backgrounds in teacher education, they discuss the direct experience garnered during field placements as the most important source for learning about teaching (Smylie 1989 as cited in Huling-Austin, 1992). There are several factors that can affect what novices learn from these field experiences. Beliefs about teaching, and personal experiences as a student can influence the new teacher's perception of the experience. Their interactions and relationships with their mentor teacher can have important effects.

Factors that can affect the lessons learned from the field component of a new teacher's training are the experiences and beliefs about teaching that the student intern brings to the situation. The student teacher brings a personal biography that affects their expectations for the experience (McIntyre et al., 1996). These expectations "represent long-held beliefs about

teachers' roles and practices, and about classrooms and schools," and create images of teaching that influence pre-service teachers' actual experiences (Cole & Knowles, 1993, p. 458). These strongly-held ideas can lead to feelings of disillusionment and discouragement as the student teachers realize that their ideas regarding the job of a teacher, as well as their beliefs about students and schools are erroneous and unrealistic (Cole & Knowles, 1993). For other student teachers, this crisis between expectations and realities causes them to examine their beliefs and revise them (Borko & Mayfield, 1995). The personal experiences and beliefs of student teachers are not the only influence on student teachers' learning in their field placement, interactions with a mentor can be important.

Studies addressing the influence of the mentor or cooperating teacher on what student teachers learn during field experiences are contradictory. Some studies find the mentor teacher has a large effect on what teacher interns learn, while others detect little to no effect by the mentors (McIntyre et al., 1996). Borko and Mayfield (1995) found the influence of some cooperating teachers to be minimal; the cooperating teachers were confused about their role and did not feel they should take an active part in the student teacher's learning to teach. Those mentors who did feel the responsibility to take an active role in the novice's teacher education had more conferences that were longer in duration than those who did not feel that same responsibility (Borko & Mayfield, 1995). Franke & Dahlgren (1996) identified five roles that the mentor could take during a student teacher's field experience: becoming a creative dialog and cooperation partner, getting the student teacher to address the students' perspective, serving as a role model, functioning as a master teacher who corrects the apprentice, and being a supportive assistant teacher.

Studies examining the topics that student teachers and mentor teachers discuss during the field experience find that prevalent topics of conversation include discussions of teaching strategies and general pedagogical issues such as the flow of the lesson and student understanding of the lesson (Borko & Mayfield, 1995; Hawkey, 1998). The two mentors in Hawkey's (1998) study mentored in the style they had experienced in their own teacher education programs. One used a very directive approach, while the other was more reflective in her orientation. Citing similar findings, Franke & Dahlgren (1996) encountered situations in which the "mentor demonstrates and the student imitates" whereas in other mentoring dyads, they observed more reflective conversations where student teachers provided a great deal of input (p. 633).

The structure of the field placement has a great effect on what students learn from the experience (Carter & Francis, 2001; Franke & Dahlgren, 1996; Gratch, 1998). More time in the field does not necessarily lead to thoughtful engagement with questions of practice and professional growth on the part of the new teacher (Huling-Austin, 1992; McIntyre, Byrd, & Foxx, 1996). Instead, it can lead student teachers to adopt "quick fixes" to long-term problems and a narrow vision of what the profession of teacher involves (Huling-Austin, 1992). In a study by Feiman-Nemser and Buchmann (1987), one teacher intern, because her mentor teacher had given good evaluations, rejected attempts by her university supervisor to engage her in reflective discussions of practice. A second intern in the same study adopted many management practices accepted at her field placement site, but not advocated by her university education department.

Novice teachers can learn much from their experiences in the field. However, what they take from those practical, hands-on encounters is influenced by the beliefs they bring to the

situation as well as their interactions with mentors and the culture of the schools where they are placed.

Changing views on mentoring. As described in previous sections, there are many possible roles that mentors can adopt as they assist new teachers with their transition into the profession. In previous decades, providing emotional support, acclimatization to the school culture, and advice about problems that arose were the goals of a mentor-protégé relationship. As the complexity of teaching has become better understood, this old model of an expert who guides an apprentice is no longer the only acceptable or most desirable type of relationship (Gold, 1996; Hargreaves & Fullan, 2000). Hargreaves and Fullan (2000) describe the four ages of professionalism in teaching. The pre-professional age occurred with the beginning of mass education, and the focus of mentoring was providing words of encouragement and sharing teaching tips. The period from the 1960's to the 1980's is referred to as the age of the autonomous professional; asking for help was identified as a sign of weakness and incompetence. The age of the collegial professional occurred from the mid-1980's to the beginning of the 21st century. During this time, the focus was on developing collaborative cultures in schools. Hargreaves and Fullan (2000) refer to the 21st century as the “fourth professional age” where the goal of mentoring relationships should be for “the content of professional learning to become wider and deeper” including such activities as “keeping up with scientific breakthroughs in the pedagogy of learning, rekindling the purpose and passion of teaching, and working with others to bring about positive reforms in education” (p. 52). With the proper kind of mentor support, it is hoped that new teachers can move beyond simple survival mode to develop into mature professionals (Ganser, 1998; Gold, 1996).

What is called for by this expanded view of mentoring is a more egalitarian relationship where mentors and protégés work together in a reflective manner to address solutions to complicated problems of practice (Cochran-Smith & Paris, 1995; Hargreaves & Fullan, 2000; Silva & Tom, 2001). Cochran-Smith and Paris (1995) describe this conception of mentoring in the following passage: “the mentoring interaction ... is located within the context of an intellectual community where everybody is engaged in the real work of learning about teaching” (p. 185). Using this conception, the mentor’s role is to serve as a role model as they help novice teachers ask critical questions about their practice and develop a disposition for life-long learning about the profession (Howey, 1988; Stanulis, 1994). Feiman-Nemser (2001), using the theories of Dewey as a basis, has coined the term “educative mentoring” to describe this type of relationship. A central goal for this form of mentoring is to have novice teachers articulate rationales for decisions they make in the classroom and analyze their practice when they feel their instruction is effective as well as when problems arise. She says:

Mentors who share this orientation attend to beginning teachers’ present concerns, questions, and purposes without losing sight of long-term goals for teacher development. They interact with novices in ways that foster an inquiring stance. They cultivate skills and habits that enable novices to learn in and from their practice. They use their knowledge and expertise to assess the direction novices are heading and to create opportunities and conditions that support meaningful teacher learning in the service of student learning. (p. 18)

Silva and Tom (2001) focus on the importance of mentors developing ways of interacting with protégés that take into account the developmental level of the protégé with whom they are interacting.

Another possible goal for this new vision of mentoring relationships includes the opportunity to reform the teaching profession by enacting a more student-centered, standards-based type of teaching (Hargreaves & Fullan, 2000; Wang, 2001; Wang & Odell, 2002). In this view, mentors would be familiar with the reform documents guiding their discipline; science teachers for example, would use the National Research Council's (1996) *National Science Education Standards* as a platform to move their discussions in reform-minded directions (Wang & Odell, 2002). In their research, Keys and Golley (1996) found that trusting mentoring relationships could be used to support the inclusion of constructivist teaching practices in the classroom. Evertson and Smithey (2000) stress the importance of the proper type of training for mentors if this vision is to be realized.

Constraints on mentoring relationships. While the previous section highlighted the promise offered by new visions of mentoring for novice teachers, there are some limitations as to what can be accomplished through mentoring alone without accompanying changes in schools as they currently exist. Structural and cultural constraints, along with a lack of time, and the danger of simply replicating current teaching norms must be considered in a discussion about mentoring practices.

As discussed previously, entry into the teaching profession is marked by challenges relating to the number of students and teaching assignments, and amount of time for planning and preparation. Assigning a novice teacher a mentor does nothing to alleviate the constraints imposed by these conditions (Huling-Austin, 1986; Sanford, 1988). In situations where new teachers have been given the most challenging teaching assignments, assigning a mentor may do little to make their transition into teaching easier (Gold, 1996). A related problem is that novices are often assigned courses that they do not have an adequate content preparation to teach

(Huling-Austin, 1992). In some cases, mentoring programs can be a less expensive alternative designed to correct larger structural problems (Little, 1990). In most cases there is no formal or informal system for rewarding those who help those new to the profession (Little, 1990).

A second major concern is that by providing support that focuses only on “teaching tips” and survival techniques, novices will be encouraged to replicate existing models of teaching rather than implementing more reform-based philosophies (Ballantyne et al., 1995; Emmer, 1986; Evertson & Smithey, 2000; Gratch, 1998; Grossman, 1992; Kennedy, 1991; Wang, 2001). In a study of over 700 teachers, Kennedy (1991) found that mentors could help novice teachers with the emotional adjustments to their new professions and could help reduce attrition, however, they did not necessarily help novices improve their teaching or critically examine their pedagogy. Using case studies of two novice English teachers, Emmer (1986) indicated that because they received support from mentor teachers at their school, the two novices followed exactly the style and curriculum used by the mentors and did not question the effectiveness of these traditional techniques. If novices are encouraged to accept advice without actively reflecting on their own teaching, it will lead to continued implementation of current routines and the stifling of professional growth (Carter & Francis, 2001; Franke & Dahlgren, 1996). In some cases, novice teachers may be more familiar with newer strategies, yet their contributions are rejected by those with more experience (Ballantyne et al., 1995; Hargreaves & Fullan, 2000; Odell 1987). Mentoring under these circumstances does not allow teachers to question larger issues of curriculum, pedagogy, or the structural arrangements of schools, eliminating discussions about inequities relating to race, gender, or culture that could be addressed (Cochran-Smith & Paris, 1995). An additional problem is that the conceptions of teaching that novices

bring from their own experience as students tends to embody a traditional view of teaching that is difficult to change even with mentor support (Kennedy, 1991).

Current aspects of the culture of schools may constrain what mentors and protégés are able to accomplish in their work together. The role of mentor may be incompatible with institutionalized norms of autonomy and equality of status leading mentors to be hesitant to offer advice (Huling-Austin, 1992; Little, 1990; Martin, 1997, Odell, 1987). The prevailing culture of schools includes isolation and an avoidance of telling others how to operate their classroom, making mentors reluctant to adopt a critical role with their protégés (Ballantyne et al., 1995; Gratch, 1998; Kay, 1990). In addition, teachers have had few opportunities that provide experience with, or models for discussions of teaching practice, or the support necessary to conduct them (Gratch, 1998; Stanulis, 1994). While experienced teachers have built up a large “wisdom of practice,” they have had little experience in making that knowledge explicit (Connely & Clandinin, 1988; Stanulis, 1994). In a study of mentor-protégé interactions, Lemberger (1992) found that two-thirds of mentors were uncomfortable in the role and were hesitant to provide guidance based on their practical experience. When teachers do work together to discuss each other’s practice, there is a focus on maintaining comfort and harmony and an avoidance of difficult and challenging discussions about teaching (Hollingsworth, 1989). In addition, new teachers may enter the profession hesitant to accept the assistance of others (Gold, 1996; Gratch, 1998; Kay, 1990; Smith, 1993).

A fourth barrier in the implementation of mentoring programs is the time necessary to develop a meaningful mentor-protégé relationship. When the mentoring relationship becomes an add-on to the other duties required of teachers, mentors and protégés alike find it difficult to carve time out of their schedules to work together (Gold, 1996, Smith, 1993). Without structural

support, time spent by the mentor in the protégé's classroom leads to time away from her own students (Little, 1990; Odell, 1987). In some cases, mentors provide brief critiques of the novices teaching without allowing time for a thorough reflective discussion leading to resentment on the part of the protégé (Gratch, 1998). Another limitation relating to time in mentoring relationships is the duration of the interaction, most induction programs support the mentor-protégé relationship for only a brief period, such as a year, while novices may need assistance for longer (Odell, 1990).

Confusion about the role of a mentor can be yet another constraint in a mentor-protégé relationship. When mentors and protégés are unclear about their roles and the overall purpose of the relationship, difficulties can arise (Ganser, 1995 as cited in Gold, 1996). Conceptions of the mentor role range from a "buddy" relationship through to master teacher-apprentice relationship (Odell, 1990). In one study of mentors and protégés, both partners held a generic, all-encompassing view of the relationship; in their view the role of the mentor was simply to help the novice become a better teacher (Abell et al., 1995). Other studies are slightly more specific. In the view of both partners, the role of the mentor is to assist the new teacher and make suggestions while allowing the novice the space to make his or her own decisions (Carter & Francis, 2001; Wildman et al., 1992). Uncertainty relating to roles and expectations can lead to frustration for both the mentor and protégé (Huling-Austin, 1990; Klug & Salzman, 1991). In some cases, mentoring programs are implemented with little conceptual understanding, a lack of planned implementation strategies, and unrealistic goals (Little, 1990).

Literature reviewed in this section highlights the fact that while mentor-protégé relationships offer much promise for assisting novice teachers, there are barriers that must be considered. Certain structural and cultural limitations found in schools can minimize the impact

of mentoring partnerships. Protégés and mentors alike find it difficult to find time for their work together, and may be uncertain regarding the nature of the relationship. The following section describes literature which relates specifically to mentoring within the discipline of science education.

Mentoring in science education. While there is a large and growing body of literature relating to the topic of new teacher mentoring and induction, there are relatively few studies addressing the topic of science-specific mentoring. Two resources discussing support for new teachers include the word science in the title, seemingly indicating that science teachers would be the focus of the work (Plummer & Barrow, 1998; Wojnowski, Bellamy, & Cooke, 2003). However, closer reading reveals that the assertions contained in the works are based on generic, rather than science-specific mentoring studies, though they do advocate assigning mentors from the same content area to new teachers.

Several of the works that do exist relating to science teacher mentoring are descriptions of mentoring programs (Diehl, Harris, Barrios, O'Connor, & Fong; 2000; Hassard & Jensen, 1988; Melancon, 2002; Upson, Koballa, & Gerber, 2002). While informative for those developing mentoring and induction programs, they are descriptions of programs, not studies of mentoring interactions. They do not specifically address the implications of mentoring support for beginning science teachers.

There are, however, a few studies which do have a focus on science-specific mentoring relationships. One case study investigated the functions of the mentor in an internship/induction program for secondary science teachers (Roberson, Smithey, & Evertson, 1997). Researchers found that the mentor science teacher served six functions: gate-keeper, model/guide, reflective practitioner, co-planner, co-teacher, and co-learner. The pairing of a novice with an expert

science teacher provided the opportunity for the intern to question his own beliefs about science teaching, critically evaluate his own effectiveness as a science teacher, and increase his repertoire of science teaching strategies (Roberson et al.1997). As in other studies (Diehl et al., 2000; Keys & Golley, 1996; Schomer & Dias, 2001), the opportunity for the mentor teacher as well as the protégé to experience professional growth based on their interactions with each other was highlighted. According to available research, one aspect of the mentor-protégé relationship that enhances this professional growth is the incorporation of reflective conversations into mentor-protégé discussions (Diehl et al., 2000; Keys & Golley, 1996; Roberson et al., 1997; Schomer & Dias, 2001). Luft, Roehrig, and Patterson (2003) compared the practices of new teachers in a science-specific induction program with those in a generic mentoring program, and those who received no mentoring at all. They found that beginning teachers in the science-focused induction group incorporated more laboratories, instructional and technology-based materials, and group work in their teaching than did members of either of the other two groups.

Current available literature relating to science-specific mentoring describes mentoring programs and details some of the functions that mentors can serve in their relationship with protégés. Studies within the science education community advocated the importance of a content area match between mentor and protégé. However, there are only a few studies that address the interactions of science teacher mentors and protégés.

Alternative Certification

Along with the growth in numbers of mentoring programs, there has been an increase in the number of alternative certification programs to recruit new teachers to fill projected shortages (Berry, 2001; Chesley, Wood, & Zepeda, 1997; Darling-Hammond, 1990; Dill, 1996; Feistritzer, 1994; Jelmberg, 1996; Stevens & Dial, 1993). These alternative certification programs have

grown in response to teacher shortages in certain areas and the call to reform higher education (Dill, 1996). Certain high needs areas such as mathematics, science, and special education used alternatively certified teachers to help fill positions (McKibbin & Ray, 1993). In 1983, there were only 8 states who offered licensure through alternative routes; by 1992 that number had grown to 40 (Feistritzer, 1993). With an increase in the number and variety of programs, there is an increase in the number of people who enter teaching through these routes (Feistritzer, 1994).

Program structure. There is wide variation in the structure and requirements for alternative routes to certification, however, they tend to be programs that allow adults with at least a bachelor's degree and work experience to enter the profession without completing a traditional four year college program (Dill, 1996). Roth and Lutz provide a useful definition of alternative certification programs; in their view, these programs encompass either “ (a) alternative means of entering the classroom, or (b) alternative means of achieving standard teacher certification” (as cited in Dill, 1996, p. 936). Typical components found in such programs include: paid or unpaid teaching internships, intensive internship supervision, and education course work taken both prior to and in conjunction with the internship (Eifler & Potthoff, 1998; Fenstermacher, 1990). Alternative certification programs tend to require fewer credit hours of education courses, but more hours of supervised field experience (Kirby, Darling-Hammond, & Hudson, 1989). The course work that alternatively certified teachers do take is especially designed to fit a practical schedule that allows them to complete their field experiences while building on the unique life experiences that these candidates bring to the teaching profession (Kirby et al., 1989). Programs range in scope from a requirement of only nine hours of course work to 45 hours of course work with an extensive supervised internship leading to a Master's degree (Darling-Hammond, 1990; Zumwalt, 1996). Some programs relax

standards to allow more people to enter the profession, while others provide preparation that is equivalent to or more rigorous than traditional programs (Darling-Hammond, 1990). Variability pertaining to when requirements must be completed is prevalent, some programs allow people with no education course work or classroom experience to become teachers and give them up to three years to complete the required courses (Chesley et al., 1997). Others require that the alternative certification process is completed prior to employment in a school (Darling-Hammond, 1990). Some alternative programs are directed and implemented by local school districts, others by colleges or universities (Kirby et al., 1989; McKibben, 1988). Because of the diversity of alternative licensure programs, they can not be evaluated as to rigor, content, and support based on the fact that they are called alternative certification programs, each must be evaluated on an individual basis (Berry, 2001).

Effectiveness of teachers trained in alternative certification programs. Though each program should be evaluated independently, there is research that seeks to generalize about alternative certification programs. Because of the wide variation between programs, studies comparing the effectiveness of traditionally versus alternatively certified teachers often contradict each other. One criticism of alternative programs is that some are based on the mistaken notion that only a thorough knowledge of subject matter is necessary to ensure good teaching (Berry, 2001). Many studies have shown that a comprehensive knowledge of pedagogy including classroom management, development of lessons, knowledge of student learning styles, and instruction in higher-order thinking skills helps new teachers have fewer problems once in the classroom (Berry, 2001). Research indicates that those who are fully prepared in their teacher training are more successful with students (Darling-Hammond, 1990). Critics argue that the shortened period required for most programs is inadequate, and therefore placing teachers

trained in this manner in classrooms has a negative effect on students. In a survey of traditionally and alternatively certified teachers and the principals of the schools where they taught, Jelmberg (1996) determined that those who completed a traditional program had more closely supervised field experiences, valued their professional education course work, and were more fully prepared than those who completed alternative certification programs.

Other studies find that participants in alternative programs can perform at levels equal to or superior to those from a traditional program even though the time required for completion is less (Dill, 1996; Houston, Marshall, & McDavid, 1993; Hutton, Lutz, & Williamson, 1990; McKibben, 1988; Stevens & Dial, 1993). Stevens and Dial (1993) found alternatively and traditionally certified teachers to be comparable on measures of student achievement and classroom performance. In a study by Houston et al. (1993), alternatively certified teachers reported more initial problems in their teaching experiences, however, by 8 months into the study they had levels of confidence and job satisfaction equal to that of new traditionally-certified teachers. Supervisors of alternatively certified teachers in the Hutton et al. (1990), study rated the performance of 91.8% of the alternatively certified teachers as equal to or superior than other first year teachers. Some research also indicates that alternatively certified teachers have higher retention rates than traditional program graduates (McKibben, 1988).

Benefits of alternative certification programs. While these programs have their critics, there can be certain benefits. Alternative certification programs tend to attract people to the teaching profession who have been traditionally underrepresented. Programs often have higher percentages of males and ethnic minorities than do traditional certification programs (Chesley et al., 1997; Feistritzer, 1993; Feistritzer, 1994; Hutton et al., 1990; Kirby et al., 1989; Shen, 1997; Zumwalt, 1996). Statistics from New Jersey and Texas show that alternative certification

programs produce more minority candidates for the teaching profession than traditional certification programs (Feistritzer, 1993).

Several studies find that people attracted to these programs are typically older and may be more mature than their traditionally-certified counterparts, bringing to the profession real life examples and applications to enrich their teaching (Chesley et al., 1997; Resta et al., 2001; Zumwalt, 1996). However, in a study of over 15,000 teachers with 10 years or less experience, Shen (1997) found information to contradict that assertion; 51% of the alternatively certified teachers entered their programs directly after college and 23.8% already had jobs in education. Several studies find that those who enter the field when they are older have lower attrition rates (Kirby et al., 1989; Resta et al., 2001). In the Kirby et al., (1989) report, 75% of nontraditionally certified teachers were still teaching two years after completing a program compared to 60% of traditional program graduates.

Researchers highlight other possible benefits for graduates of alternative certification programs. Program participants who leave other careers to enter the teaching profession tend to be highly motivated and enthusiastic and may be more familiar with local culture than recent graduates of traditional programs who move to a new area (Dill, 1996). An additional benefit is that alternatively certified teachers may provide teachers for rural districts that have difficulty finding an adequate supply of teachers (McKibbin, 1988). Proponents also point to the opportunity to provide a direct link between theory and practice for teachers certified in alternative programs (McKibbin & Ray, 1993).

Concerns about alternative certification. While alternatively certified candidates may have characteristics desirable for new teachers, there is the concern that because people in alternative programs did not choose teaching as their first career, they lack the commitment

necessary to succeed in the profession (Stevens & Dial, 1993). Others argue that because of their experiences prior to coming to the classroom, they are able to apply what they are teaching to real world situations to enrich the experience of their students (Resta, Huling, & Rainwater, 2001). These career-changers may enter the profession to find a better fit between their personal values and their work, or because they feel the need to make a contribution to society (Crow, Levine, & Nager, 1990). Alternatively certified career-changers can be those who desired a career in teaching earlier in their lives but were discouraged by circumstances or people who influenced their decision. These people later realize that teaching is the career they desire and alternative programs make the career change feasible (Crow et al., 1990). While there are studies that indicate that the attrition rate for alternatively certified teachers is lower than that for traditionally certified teachers, others indicate the attrition rate is actually double that of traditionally certified teachers (Berry, 2001 citing Darling-Hammond, 1999).

While some authors focus on the benefits to students of the life experiences that alternatively certified teachers bring to their new profession, there are some tensions that may arise as a result of this background. Alternatively certified teachers may have difficulty as they transition from a career in which they accrued respect and experience into a situation in which they are again novices; this may make them even more reluctant than other new teachers to ask for assistance when they need it (Crow et al., 1990). Skills valued in their previous careers may not be the same ones that translate into success in teaching and the alternatively certified teachers may be unwilling to deviate from strategies that had previously been successful (Eifler & Potthoff, 1998).

One of the tenets supporting the use of alternative certification programs is the premise that career-changers will bring with them a wealth of content knowledge (Kennedy, 1991).

Critics caution that this proposition can be dangerous; they argue that on-the-job experience may not translate into the type of content knowledge needed to work with students, and that knowledge in some fields grows so rapidly that alternatively-certified teachers may have forgotten or not been exposed to the content that they need (Hawley, 1990). McKibbin and Ray (1993) report that even when alternatively-certified teachers possess adequate content knowledge, they need assistance as they design lessons to translate their own knowledge into activities that help students understand that content. Alternatively certified teachers may lack the pedagogical content knowledge to develop “appropriate instructional sequences,” and resort to imitating the ways they were taught as students, using strategies that may not be appropriate or effective (J. Shulman, 1989, p. 5). The focus of these lessons may be the new teacher’s content knowledge rather than student understanding (Grossman, 1989). The fear is that without guidance and support, these teacher-centered strategies will form the basis of alternatively certified teachers’ classroom practices (Hawley, 1990).

Graduates of alternative programs are more likely than their traditionally certified counterparts to teach in under-resourced urban schools, fulfilling a crucial teacher shortage in those areas (Dill, 1996; Feistritzer, 1993; Stoddart, 1993). Data from the National Center for Education Information indicate that approximately 20% more of individuals who complete an alternative program are willing to teach in urban schools than those who complete traditional certification programs (Feistritzer, 1993). While alternatively certified teachers are more likely than their traditionally certified counterparts to teach in urban settings, there is concern that students who need the most experienced and able teachers are being taught by novices without adequate preparation (Berry, 2001; Dill, 1996).

Other scholars argue that alternative programs are driven by political motivations. Alternative programs are seen as a relatively inexpensive alternative for states who do not want to invest in increasing teachers' salaries or in serious training for those who desire to be teachers, but can not afford the necessary preparation (Darling-Hammond, 1990). The existence of alternative certification programs are partially justified by a shortage of qualified teachers, however, certain aspects of teaching such as low salaries and difficult working conditions that cause high rates of attrition are not ameliorated by increasing teacher supply through alternative programs (Kirby et al., 1989).

Role of mentors in alternative certification programs. A strong mentoring component is an oft included aspect of alternative certification programs (Chapelle & Eubanks, 2001; Chesley et al., 1997; Feistritzer, 1993; Hutton et al., 1990; McKibbin, 1988). In some cases, these are informal relationships with little to no compensation for the mentors, in others mentors receive stipends and release time from their own classes to support their work with alternatively-certified novices (McKibbin, 1988). Mentors for alternatively-certified teachers serve many of the same roles as mentors of traditionally-certified teachers, however, alternatively-certified teachers have some unique concerns that must be addressed. Alternatively certified teachers need assistance as they cope with differences between work in schools and industry, differences between work with adults and students, and the frustration that can accompany the transition between the new teacher's feelings of experience and accomplishment in their previous profession and their position as a novice in their new teaching career (Eifler & Potthoff, 1998). Because alternatively certified teachers have little to no experience in the classroom other than their own experience as students, their relationship with a mentor can be an important part of their transition into a teaching career (Chesley et al., 1997; Dill, 1996). Mentor relationships can reduce the sense of

isolation for these new teachers who are often coming from environments where cooperation and group interaction were the norm (Hawley, 1990). As with traditionally-certified teachers, an early focus on survival skills without an eye toward professional growth can stunt the development of a new alternatively-certified teacher (Chesley et al., 1997). In a study of one California program, the interactions with mentor teachers were rated as the most valuable aspect of the program due to the focused nature of the support interns received (McKibbin & Ray, 1993). Resta et al. (2001), found similar results regarding the importance of mentors in their study of another California program.

Though the relationship with the mentor is important, unique tensions can arise in mentoring partnerships between experienced teachers and these nontraditional entrants to the profession. Mentors may be reluctant to offer input or advice to an alternatively certified teacher because they may be older than the mentor (Eifler & Potthoff, 1998). Alternatively certified teachers may be hesitant to ask for assistance even when they need it (J. Shulman, 1989). Alternatively certified teachers, because of their life experience may be perceived to be new to the building rather than new to the profession and so are perceived to need less assistance (Chesley et al., 1997; Eifler & Potthoff, 1998). As with other novice teachers, confusion and frustration can occur when mentors and protégés are not clear about the roles and responsibilities of each member of the pair (Eifler & Potthoff, 1998).

While there may be some areas of tension in relationships between mentors and protégés, comprehensive mentor support can help increase the retention rates of alternatively-certified teachers (Colbert & Wolff, 1992). In a study of 103 first year teachers who had completed an alternative certification program, Chesley et al. (1997), found that those with strong induction support experienced fewer difficulties working with at-risk students and using varied

instructional strategies. A study of 69 traditionally-certified teachers and 162 alternatively-certified teachers by Houston et al. (1993), indicated that after 8 months of teaching both groups rated their mentors as equally effective and listed managing the classroom, lack of adequate resources, and problems with school administrators as the issues where mentors provided the greatest amount of assistance. Problems can occur, however, when mentors promised to novice alternatively-certified teachers by administrators or program officials do not fulfill their obligations leaving the new teacher with little background preparation and inadequate on-site support (Darling-Hammond, 1990). Several studies report that even though mentoring is described as an important aspect of the program and mentors are assigned to the novice, the alternatively certified teachers do not receive the guidance and support outlined in program guidelines (Hawley, 1990; J. Shulman, 1989).

Alternative certification in science education. Few studies directly address alternative certification within the discipline of science education. A survey of several alternative programs for mathematics and science certification revealed that those who entered the teaching profession from science careers tended to come from lower-paying technical and support jobs (Kirby et al., 1989). As candidates in this study entered the classroom, they reported “reality shock” as they were unprepared to handle classroom management and student motivation, as well as the enormous demands on time and energy required by teaching. Only half of those surveyed planned to make teaching a career.

Salyer (2002) conducted a descriptive study of the science teachers in two programs at a southern university. She found that of 32 students who were in a position to be assigned a mentor, 22 were not assigned mentors and the ones who were had mixed responses to the interactions, with many reporting that the mentor provided little assistance. In Salyer’s study,

candidates entered the alternative program to make a contribution to society, because they had prior experience in a teaching situation, to facilitate spending more time with their own children, or due to job availability.

Proweller and Mitchener (2003) describe the experiences of candidates in an alternative certification program for middle school science which has as its specific focus the incorporation of social justice, national science education reform documents, and culturally sensitive science pedagogy. Teachers in this program use their life experiences and reflective conversations to critically examine their experiences teaching urban youths to improve their practice.

Currently, few studies specifically address alternative certification programs within science education. The ones that exist provide descriptions of several programs as well as the participants in them. At least one of these studies highlights the varying influence that mentors can exert of program participants.

Theoretical Frameworks

Theoretical frameworks provide a scaffolding or frame that function to support any research study (Merriam, 1998). These frameworks provide a lens through which research questions and the interpretation of results are approached. Research problems can be addressed in many ways depending on the orientation of the researcher, and there must be some entry point for understanding (Willamson, 2003). In this study three theoretical frameworks: situated learning, border crossing, and teacher development provide the foundation through which to view this work.

Situated learning. As prospective teachers in an alternative certification program complete the process, they leave the culture of their previous jobs and enter that of teaching. They are guided in this process by interactions with their mentor teachers. One of the key tenets

of this arrangement is the notion of situated cognition, the idea that learning is a social process inextricably linked to and dependent upon the context in which it occurs (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Rogoff, 1990). According to Brown, Collins, & Duguid (1989), “The activity in which knowledge is developed and deployed...is not separable from or ancillary to learning and cognition. Nor is it neutral. Rather, it is an integral part of what is learned” (p. 32). This viewpoint emphasizes the importance of learning *in situ*; in the case of this study, knowledge about science teaching is developed through the process of teaching science. This learning about teaching does not occur within an individual in isolation. What is learned is heavily dependent on the social situation in which the learning occurs (Druckman and Bjork (1994) as cited in Abell (in press)). As teacher interns enter the profession, the social interactions of the school and classrooms they experience affect what they learn during the experience. In their apprenticeship with a more experienced science teacher, interns have the opportunity to develop more complex understandings of their knowledge about science content and pedagogy as they apply what they have learned to new situations they encounter in the classroom context (Brown, Collins, & Duguid, 1989). The idea of situated learning can be used as a basis to justify the importance of field experiences in teacher education (Abell, in press).

Closely linked to situated cognition is the notion of legitimate peripheral participation articulated by Lave and Wenger in their 1991 work *Situated Learning: Legitimate Peripheral Participation*. Legitimate peripheral participation occurs as newcomers move from peripheral to full participation in the sociocultural practices of a community by taking on more of the responsibilities associated with membership in the community. Learning involves developing a new identity as a member of the community one is trying to enter; this learning occurs as newcomers engage in the practices of the community (Lave & Wenger, 1991). As novices

become enculturated into a new situation, they depend on the expertise of a trusted guide (Rogoff, 1990). In this study, science teacher interns learn about science teaching within the context of school classrooms with the assistance of more experienced science teachers. These mentors support and instruct the interns as they take on tasks associated with the job of teaching such as classroom management and planning and implementation of lessons. Problem solving and shared communication are important as the mentors scaffold the activities of the protégé to assist them as they move towards the goal of becoming full participants in the community of science teachers (Lave & Wenger, 1991; Rogoff, 1990). This view of learning supports the idea that both the mentors and protégés are participants in the process of constructing knowledge related to their own teaching rather than passive recipients of knowledge about science teaching (Abell, in press; Brown, Collins, & Duguid, 1989; Rogoff, 1990). Intersubjectivity, or mutual understanding that occurs between people, is vitally important to this process as mentors and protégés are partners and must adapt their communication to each other during their work together (Rogoff, 1990).

Border crossing. A second framework element that helps to ground this study is that of border crossings (Aikenhead, 1998). While originally used to conceptualize the cultural bridge that students may have to make between their experiences with science outside of school, and those within school science classrooms, the framework can provide a useful means of thinking about the transition that alternatively certified teachers must make between the culture of their previous careers and that of science teacher (Williamson, 2003). Crossing a cultural border includes learning new language and norms of behavior (Phelan, et al., 1998). As science teacher interns move from their previous careers into teaching, they must adapt to the language and culture patterns of their new profession. In particular, they must learn to navigate the culture of

their mentor teacher's classroom, as well as the larger school context. These borders may also include differences in status where alternatively certified teachers shift in role from experts in their previous fields, to novices within the context of teaching. Alternatively certified teachers may be forced to confront the disconnection between their own experience with science in other arenas and the realities of science as taught in middle and secondary schools. One of the principal tenets of Phelan et al.'s (1998) work is that the degree of match between two different worlds is inversely proportional to the amount of effort necessary to negotiate a cultural border. In the case of science teacher interns, there may be a great amount of discontinuity between the culture of their previous profession and that of teaching.

Teacher development. Because a focus of this study is what alternatively-certified teachers learn from their experience working in the classroom of a mentor teacher, it is important to review the literature relating to "learning to teach." There is a large and diverse body of research, originating from several different theoretical frameworks related to the topic. Because of the vast and complex amount of information pertaining to this topic, it is impossible to use only one model or theory to explicate the process (Feiman-Nemser & Remillard, 1996). For purposes of this review, literature pertaining to the sources of teacher knowledge and the various and interrelated components of teacher knowledge will be included. Though science teacher interns bring some knowledge and beliefs with them to the program, the hope is that through their work in the program, especially in the internship component, they will add to their knowledge about the profession.

New teachers learn to teach using information from a variety of sources, these include: experiences as students, preservice teacher education programs, experiences in the classroom, and other teachers.

New teachers rely on their own experiences as students to inform their view of what teaching is and how the job should be done; they think back to experiences in college and in high school to determine appropriate teaching strategies to use in the classrooms they enter (Borko & Putnam, 1996; Feiman-Nemser & Remillard, 1996; Grossman, 1989; Lortie, 1975). Kennedy (1991) found that differences in prospective teachers at the end of a pre-service program was more heavily affected by the experiences and beliefs they brought to the program rather than the structure of the program itself. The beliefs that teachers bring to the process of learning to teach interact with their experiences in their pre-service programs.

The formal preparation for learning to teach, which includes subject matter and education course work along with field experiences, occurs in colleges and universities. Prospective teachers often take content courses from one department, while completing their education courses and field experiences in another. Many new teachers indicate that their experiences in these settings were not adequate to prepare them for the profession (Feiman-Nemser & Remillard, 1996).

As novice teachers begin teaching on a full time basis, the experiences they have in classrooms influence the process of learning to teach. Teachers often indicate that the field experiences in their pre-service program and their experience on the job are the most critical sources of their knowledge about teaching (Grossman, 1989). Research indicates that the first year of teaching can be particularly formative to the career of a new teacher (Feiman-Nemser & Remillard, 1996). Students in novice teachers' classes can be an important source of knowledge. A study of science teachers conducted by Loughran (1994) indicates that feedback, acceptance, and resistance from students influenced novices' views of teaching and the teaching strategies they were willing to attempt. As novices gain experience and confidence from surviving their

first year in the classroom, they may be willing to attempt activities or techniques that seemed too risky during their first year; this confidence can allow them to incorporate more flexibility and student involvement into their plans; they no longer feel the need to be the source of all knowledge in the class (Loughran, 1994). Other scholars, however, issue cautions about what is learned by new teachers in the isolation of their classrooms (Grossman, 1989; Livingston & Borko, 1989). In a study of three teachers without formal educational training, the new teachers found it difficult to deviate from their apprenticeship of observation; they could not reconceptualize their strong content knowledge in a way that increased student understanding (Grossman, 1989). One particular problem that the teachers in Grossman's study experienced was their inability to anticipate the range of student knowledge or their potential areas of difficulty with the content.

A second important component of literature relating to learning to teach outlines the various types of knowledge that teachers must have to adequately perform in the classroom. Borko and Putnam (1996) conceptualize these knowledge bases as: general pedagogical knowledge, subject matter knowledge, and pedagogical content knowledge. Scholars in the field recognize that teachers do not draw on these areas of knowledge independently, rather they incorporate all of these areas as they make decisions in and about their teaching (McDiarmid, Ball, & Anderson, 1989).

Skills and knowledge incorporated in teachers' general pedagogical knowledge include: classroom management, strategies for conducting lessons and developing classroom environments conducive to learning, and knowledge about learners and how they learn (Borko & Putnam, 1996). New teachers need knowledge of the students that they teach. Even if new teachers have subject matter knowledge and pedagogical content knowledge, they must

ascertain how to incorporate that into their work with particular groups of students (Feiman-Nemser & Parker, 1990).

Having a knowledge of the subject matter to be taught is critical for a new teacher. Emmer (1986) found that the setting of the teacher's first experience was of vital importance in shaping their choice of student activities and that those whose preservice training was not in the same grade level and/or subject of their training were most "at risk" during their first year. Scholars have indicated, however, that subject matter knowledge alone is not enough. Beginning teachers have to think about content knowledge from the perspective of students and their understandings; in some cases, new teachers may be learning the content themselves for the first time while simultaneously trying to determine how to share it with students (Feiman-Nemser & Parker, 1990).

The notion of pedagogical content knowledge for teachers has become an important one in relation to the unique set of knowledge that experienced teachers develop about their profession in relation to their content area. L. Shulman (1986) defines pedagogical content knowledge as "the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations-in a word, the ways of representing and formulating the subject that make it comprehensible to others" (p. 9). One of the major areas of learning for novice teachers involves developing their pedagogical content knowledge. While new teachers may have an adequate knowledge of the content they are to teach, they have not learned transform that knowledge into plans for the classroom that help students develop their understanding (Huling-Austin, 1992; Russell, 1993). Kennedy (1991) points to the difficulty that new teachers have as they change their conceptual frameworks. In their college content courses, the focus was on learning for mastery; prospective teachers may

have been bombarded with massive quantities of information without understanding the fundamental concepts of the discipline or the connections between them.

As novices learn to teach, they must incorporate a variety of types of knowledge, including understandings about content, pedagogy, and pedagogical knowledge into a framework that allows them to teach the students in their classes. It is through their interactions with a variety of sources such as students, educational course work and other teachers that they garner this knowledge. The focus of this study is the understandings that they develop through their work with a mentor teacher and how that knowledge develops within the context of the field experience.

CHAPTER 3

METHODOLOGY AND PARTICIPANTS

The purpose of this study was to examine relationships between mentors and protégés during the internship component of an alternative certification program. Research focused on relationship development between mentors and protégés, and the evolution of the protégés' knowledge about science teaching which occurred as a result of their interactions. The following research questions guided this study:

- 1) What is the nature of the advice and guidance given by a science teacher mentor?
- 2) What do the mentor and protégé each gain from the relationship?
- 3) What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them?
- 4) How does the relationship change over the period of the study?

The nature of the research questions and theoretical frameworks guiding the study meant that I needed to spend a considerable amount of time with the participants in their schools watching their teaching, as well as their interactions with each other. It was necessary that I talk with all participants frequently about their experiences in the classroom, their developing understandings of teaching practices, and their relationships. For these reasons, I chose to use ethnographic methods for data collection that included interviews, observations, and collection of artifacts (Spradley, 1980).

As I thought about how to represent these data to a larger audience, I felt it was important to use the participants' words as much as feasibly possible to represent their experiences. A

second important consideration was the nature of the research questions. Because the interactions of the participants contained many unfolding stories, it seemed that a narrative approach to representing their experiences was most appropriate. The narratives developed were organized into cases that described the experiences of each mentor-protégé pair over the course of the internship (Merriam, 1998).

In the following paragraphs, I build on the skeleton overview provided thus far to present a more thorough description of the methodological framework, participant selection, methods of data collection, and methods of data analysis and representation. The chapter concludes with a narrative introduction to each of the four participants.

Methodological Framework

The guiding methodological framework for this study is narrative inquiry. According to Clandinin and Connelly (2000, p. 20), “Narrative inquiry is a way of understanding experience. It is a collaboration between researcher and participants, over time, in a place..., in social interaction.” My support for this approach is based on two bodies of literature: that which supports narrative as a way of understanding human experience, and that which advocates narrative as an especially useful format for gaining understanding of the complexities of teachers’ experience and practice.

The seminal work which provides a rationale for narrative ways of understanding human experience is Jerome Bruner’s *Actual Minds, Possible Worlds* (1986). In this book he postulates the existence of two modes of thought, paradigmatic and narrative. He characterizes the paradigmatic mode as logico-scientific, and contrasts this with the narrative mode which “deals in human or human-like intention and action and the vicissitudes and consequences that mark their course” (p. 13). While Bruner indicates that each is equally useful and appropriate

depending on the situation, the two cannot be reduced to each other; they are separate ways of understanding the world. Building on Bruner's foundation, other scholars have argued that humans understand their lives in a storied form, making narrative an appropriate way to explore their experiences (Connelly & Clandinin, 1990; McEwan, 1997; Polkinghorne, 1988, Polkinghorne, 1995).

Narrative research has gained support in the field of education because it is seen as a vehicle to gain insight into teachers' understandings of their work (Cortazzi, 1993). Narrative enables people to preserve richness and detail as they share their experiences with others (Carter, 1993). Elbaz argues that teachers structure their understandings in the form of stories and thus teachers' knowledge is best understood in narrative formats (1991). Sharing similar beliefs, other researchers have claimed that personal narratives are the tools that teachers use to make sense of their practical experiences in the classroom and thus, they are the representations that researchers should use to understand those experiences (Connelly & Clandinin, 1990; Gudmundsdottir, 2001). Another argument for using this type of approach for the study of classrooms and teachers is that it redresses two problems associated with previous educational research: the reduction of teaching into discrete variables tested one at a time, ignoring the complexity of teachers' realities, and the model of the deficient teacher contrasted with educational researcher as all-knowing expert (Carter, 1993; Doyle, 1997).

The purpose of this section was to describe the rationale for the use of narrative inquiry as a methodological framework to guide the study. Most important is the tenet that, "Humans are storytelling organisms who, individually and socially lead storied lives. The study of narrative, therefore, is the study of the ways humans experience the world" (Connelly & Clandinin, 1990, p. 2). From this outline of the foundation of the methodology of the study, the

following sections provide a detailed description of the procedures used. The account begins with the selection of the participants.

Selection of Participants

Participants for the study included two interns completing an alternative certification program in secondary science, and their mentor teachers. Using available literature pertaining to alternative certification programs, along with a wealth of experience in science teacher education, the department of science education at the University of Georgia designed its own alternative certification program for secondary science teaching.

The program, called the Program for Alternative Certification in Secondary Science (PACSS), is designed to allow people who have a science background and wish to enter the teaching profession an opportunity to do so while remaining employed. PACSS provides an option for people with at least an undergraduate degree in science, or a related field, to become certified to teach in grades seven through twelve in one of the following science disciplines: biology, chemistry, earth science, or physics.

One strong component of the program is a field-based experience with the support of a mentor teacher. Participants complete the field work component of the program by choosing one of two routes. They may teach in a public or private middle or high school on a provisional certificate, or they may choose to intern for at least twenty hours a week in the classroom of a mentor teacher. When people choose the internship option, they are required to spend two semesters in that classroom. Program participants receive 12 hours of course credit for their field-based experiences.

In addition to the fieldwork experience, participants complete 18 additional hours of course work. Courses include: Methods of Science Teaching, Science Curriculum and Learning

Theory, Philosophy and Leadership in Science Classroom Practice, and Technological Capabilities for Science Teaching. A course in educational psychology and a course in special education are required as well.

The two protégé participants chosen for this study were not teaching provisionally; they selected the internship route. They were chosen based on the belief that in situations where interns were required to spend all of their time in the classroom of another teacher, the mentor would have greater influence than those mentors of provisional teachers who may have less time for work with a protégé. I wished to explore these types of close mentoring relationships.

From the total number of PACSS interns, I used several criteria to narrow the field of possible participants. Because my own teaching experience was in a high school setting, I chose interns placed in a secondary, rather than middle school situation. During the year that data collection took place, I served as a university supervisor for participants in the PACSS program. To avoid feelings of pressure on the part of participants, I chose not to work with any interns for whom I was the university supervisor. A final criterion used in selection was the experience of the mentors with whom interns were placed. I felt it was important that mentors who participated in the study have experience and training as mentors. I worked with the director of the program, who had a history of working with science teachers in the area, to determine which mentors had completed mentor training and had had positive experiences working with protégés in the past. Interns working in high school settings with experienced mentor teachers formed my short list of possible participants. This type of selection, in which the researcher chooses participants based on the recommendation of experts familiar with the population to be studied, is known as reputational case selection (LeCompte & Priessle, 1993). Using the selection criteria, a list of two possible protégé participants was generated. The selected interns were

approached on the first night of their fall semester methods class with a brief description of the project, and both agreed to participate in the study. Their assigned mentors were contacted and both indicated their willingness to cooperate. Once participant selection was completed, data collection began.

Data Collection

Interviews and observations conducted between August 2002 and April 2003 were the primary sources of data for the study. Secondary data sources included lesson plans, copies of class activities, notes given by the mentor to the protégé, and emails sent from participants to me. I kept a research journal where I described reactions to particular interviews, possible interview questions, and emerging understandings of the data. These secondary sources played a lesser role in data analysis though the notes from mentors to protégés and emails from participants to me were influential to my thinking. This section on data collection begins with a timeline for collection followed by a more thorough description of each of the data sources and how they were developed and enacted.

Timeline. Data collection began in the fall of 2002. I interviewed each participant before the start of the internship to gain an understanding of their science and teaching backgrounds, views of science teaching, and expectations for the relationship. These interviews occurred in late August and early September. Appendix A contains the protocol for these interviews. Because of complications with paperwork in the student teaching placement office, the protégés did not begin their internship placements until late September. In the interim between the first interviews and internship placement, I used data collected in the initial interviews to construct first person narrative descriptions of each participant. These were shared with each participant in interviews once the internships began to give participants an opportunity to comment on whether

the narratives captured the ideas they expressed in the first interviews, and to allow for clarification if participants felt it was needed.

Once the internships began, I visited each pair on an approximately weekly basis. Appendix B contains a detailed log of the times and dates for school visits. During these trips I observed one to two class periods and interviewed each of the participants separately. Over the course of the study, I tried to visit different class periods to get a sense of how they varied. I purposefully visited more frequently during each pairs' planning period to see the conversations about planning and teaching that occurred during those times. Over the course of the year, I interviewed each participant approximately 15 times and made approximately 15 observations of each pair. I attempted to visit each pair on a weekly basis, though scheduling conflicts and school holidays necessitated flexibility in arranging visits.

The heaviest periods of data collection occurred between October and early March. At that point, the relationships did not seem to change a great deal and conversations in interviews began to repeat themselves. I felt I was not gaining new insights based on my observations. I felt that saturation of the data had occurred (Bogdan & Biklen, 1998). I did return to the sites at the end of April, near the completion of the internships, for one concluding interview during which participants reflected on their overall experiences with their mentoring relationships and reviewed narratives that had been constructed.

The timeline provided in the previous section explains the general pattern of interactions with participants. The following sections on interviews and observations provide a more detailed description of the primary methods used for data collection.

Interviews. Frequent interviews with the four participants supplied much of the data for this study. As previously stated, one of the principles guiding my research was an attempt to

incorporate the participants' voices into the study. As Weiss (1994, p.1) aptly stated, "We can learn..., through interviewing, about people's interior experiences. We can learn what people perceived and how they interpreted their perceptions. We can learn how events affected their thoughts and feelings." This passage summarizes my goals for the interviews I conducted. Because I could not be present on a daily basis for all interactions between mentor and protégé, I relied on participants to tell me about the most salient experiences in their relationships and how they interpreted those.

Interviews were semi-structured in nature, but grew more conversational as the study progressed. They ranged in length from 20 minutes to an hour depending on time constraints and participant responsiveness. I made verbatim transcripts of each interview before my return visits to the schools in order to become familiar with the data and to determine what questions would be asked the following week. As I transcribed, I recorded possible questions for the next visit in my research journal. In cases where I could not get the transcription done quickly enough, I listened to the tape of each interview to determine the interview guide for the next week. Two sample interview protocols can be found in Appendix C.

The first question typically asked of participants during each interview was, "Tell me about what you've been doing this week." This approach allowed participants to speak freely about topics pertaining to the relationship that they felt were important. Subsequent questions were based on follow-ups from the previous week's interviews, probes based on the observation that day, or probes based on participant responses to the initial interview question.

As the study progressed, interviews were used for member checking (Bogdan & Biklen, 1998). As I constructed data charts where sections of interviews were grouped based on their relationship to the research questions, I shared these charts with participants and asked if they

thought my choice of interview excerpts and groupings were appropriate. Later in the study once narratives were developed, I showed them to participants and asked for their feedback. I wanted to ascertain whether the narratives that I constructed based on my interpretations of their experiences meshed with their own understandings.

While interviews were an important avenue of data collection for the study, observations of participants' interactions provided a second crucial source. In many ways, the observations and interviews informed each other. Methods used in observation are described in the following section.

Participant Observation. Dewalt and Dewalt (2002, p. 2) describe participant observation as a “way to collect data in naturalistic settings.” Using this method, they continue, the researcher can “observe and/or take part in the common...activities of the people being studied.” This describes my purpose in observing the classroom teaching and planning periods of the two pairs of participants in the study. It was important for me to see how the mentors and protégés interacted with each other in the context of their classroom setting as they carried out their daily routines. Participant observation can involve a range of possible levels of involvement on the part of the researcher. Using the categories outlined by Spradley (1980), I describe my level of participation in the site as moderate. I did not actively teach or plan with the participants, however, I was not an outsider who just observed. I engaged in conversation with them during the observations, sometimes ate lunch with them, and when asked, interjected ideas for lessons or strategies I had seen other teachers enact in similar situations.

As I observed the participants in action, I took detailed notes of what I saw in my field notebook and procured copies of notes and hand-outs for activities undertaken during my visit. Because it is impossible to capture everything that is happening in a classroom at any given time,

I needed a focus for my observations. I chose to channel my attention on what each member of the pair was doing during the class periods and the interactions between them, rather than the activities of the students. In observations of planning periods, the focus was again the interactions between mentor and protégé where I attempted to capture as many verbatim quotations as possible. In addition, I made notes of questions that I wanted to ask in the interviews based on what I had seen during the observation. As soon as was feasibly possible after leaving the sites, I entered my scratch notes into a word processor program and expanded my fieldnotes adding details that I could remember, but could not write fast enough to capture (Sanjek, 1990).

In a few cases, both pairs were doing something that I wanted to see at the same time, and it was impossible for me to be in both places. In these instances, I gave one pair an extra tape recorder and asked them to record specific conversations. Verbatim transcripts were made of these tapes.

Transcripts of interviews and fieldnotes from observations were the primary sources of data for the study. Interview questions for each week emerged based on classroom observations and striking comments made in previous interviews. The following section explains how this data was translated into the narratives that were the product of the study.

Data Analysis

The accumulation of data collected in 60 interviews and 30 observations resulted in 260 pages of data for one pair and 374 pages for the other. This archive of data had to be transformed into a narrative representation of the experiences of these participants that would not overwhelm readers. This transformation of the data was a multi-step process that occurred throughout the

course of the study. The three major steps in the process were analysis of narratives, narrative analysis, and cross-case analysis (Merriam, 1998; Polkinghorne, 1995).

Analysis of narratives. Polkinghorne (1995) describes analysis of narratives as a paradigmatic way of understanding human experience. In his view, when the researcher undertakes this process she, “seeks to locate common themes or conceptual manifestations among the stories collected as data” (p. 13). Though Polkinghorne does not provide explicit instructions for how to do this, the idea formed the basis for my own version of the process.

For me the process began with a reading and rereading of the interview transcripts and fieldnotes once they were entered into the computer. Systematic coding of the data started at the Christmas holiday. In the first iteration of coding, I read the interview transcripts and used highlighters to color code sections of data based on which of the four interview questions was addressed by a particular section of data. These sections were in essence short stories told by participants that addressed one of the research questions. They ranged in length from four to five lines up to 20-30 lines. Once the highlighting was complete, I used a word processing program to copy and paste the data into charts for each pair, for each research question. In other words, each pair of participants had their own chart for each research question. Each chart was divided into three columns: one to identify the source of the quotation, one to house the quotation, and one to allow a place for notes and codes. A sample of one page of one data chart is found in Appendix D. The construction of these charts was an ongoing process that lasted from December through the end of data collection.

As I constructed the charts, a second more specific round of coding began. Codes can be thought of as labels or units of meaning attached to sections of data collected during a study

(Miles & Huberman, 1994). As I looked at the stories included in my charts, I assigned a word or words to them to capture the gist of each story.

Once this process was complete, I continued with analysis research question-by-research question for each pair using an inductive process. One chart at a time, I used scissors to cut the stories apart and stack them into groups that shared some common element. As the process was completed, I reread all of the stories in each stack and determined the thread that connected the snippets in a particular group together (Coffey & Atkinson, 1996). These I labeled as the themes present in the data. Themes present for each pair are summarized in Appendix E.

This process of coding stories and grouping them into themes facilitated the second major area of analysis in my work, narrative analysis. Themes constructed through the analysis of narrative process provided the framework that determined which narratives I constructed, and how I organized them.

Narrative analysis. The process of narrative analysis involves synthesizing the data “into a coherent developmental account” that represents the experiences of the participants (Polkinghorne, 1995, p.15). This type of analysis aligns with Bruner’s (1986) narrative way of knowing. I combined the smaller stories, generated during the analysis of narratives, into longer accounts using the research questions and themes to provide the organizing structure.

I planned to organize the data around the specific research questions. I also wanted to present each pair as their own unique case. In thinking about how to structure the narratives within that framework, I decided that it was important that each participant’s voice be heard presenting their own version of the story for the questions pertaining to tensions, gains, and change. For each of these three research questions, a separate set of narratives was generated for each mentor and each protégé, though the narratives for each pair were included in the same

chapter. This separation of voices was particularly necessary because in some instances, the perception of the mentor and protégé about the same event was very different. In the case of the advice question, mentors and protégés shared similar perspectives so it seemed more appropriate to generate only one narrative for each pair relating to this question. However, the contribution of each participant is clearly labeled with their name.

To construct the narratives, I worked on the themes for one question, for one pair at one time. For instance, a theme for one protégé's tension narrative was "roles and responsibilities of a science teacher." I organized all of the pieces of data related to this theme, for this participant, in chronological order, and then compiled them into a coherent narrative using the participants words. In some instances, I had to add words for readability because spoken language is so different than written. In these instances, I indicated my words in brackets. All other words are directly from participants, though I chose the order of the sentences. One example of the transformation from raw data into finished narrative is included in Appendix F. In each instance, I kept all of the bits of data included in the narrative as well as the stories that were omitted. I used the same technique, until all of the themes and questions had been addressed for each pair.

I found the participants' experiences with the tensions in their relationship to be the most fascinating. I also felt that question was the one where I was most likely to misinterpret the perceptions of the participants. For this reason, I worked to make sure those were constructed for each participant while I still visited the site frequently. I shared each participant's own tension narrative with them during an interview. For the other three questions, I emailed the narratives to each participant once they were completed and asked for feedback. After the final interview, I added to each narrative based on the overall reflections of the participants.

Once I completed this analytic work, I shared the finished product with two members of my committee. Both agreed that the chapters were too long and I had included too many narratives to support the various themes. They requested that I return to the chapters and choose one or two narratives to provide support for each theme. This resulted in an omission of approximately one third of the narratives generated for each pair. The choice of which narratives to omit was based on repetitiveness. In cases where several narratives illustrated the same theme, I left one or two examples and omitted the others.

The final form of data analysis involved comparing the themes generated for each of the two pairs to determine similarities and differences between the experiences of each. A brief description of this process is included in the following section.

Cross-case analysis. The final step in analyzing the findings of the study was a comparison across the cases of the two pairs in an effort to find patterns common to the experiences of both (Merriam, 1998; Miles & Huberman, 1994). The first step in this comparison was to re-read the cases generated for each pair, and consult the detailed outlines made for each chapter. The research questions provided the framework for the comparison. In each case, for each research question, I looked for similar experiences for the protégés and the mentors. I also looked for instances where experiences of the two pair differed. In instances where I found commonalities, I tied these to related education literature.

As I designed and carried out the study, I attempted to incorporate strategies to improve the trustworthiness of my work. A description of these techniques is included in the following section.

Trustworthiness of the Study

The goal of any qualitative researcher is to convince an audience that the findings of the study can be trusted and are worthy of attention (Lincoln & Guba, 1985). Wolcott (1994) describes this idea as “getting it right” or trying not to “get it all wrong.” There are several ways that I have tried to achieve this criteria through the design, data collection, and data analysis of this study.

There are certain strategies associated with trustworthiness, that I see as almost taken-for-granted aspects of quality research. These include such things as tape recording all interviews and making verbatim transcripts; expanding fieldnotes as quickly as possible following a site visit; conducting interviews in which the participants, not the researcher is doing the majority of the talking; and collecting multiple types of data to provide the opportunity for triangulation. I employed all of these approaches in this study. Trustworthiness, however, means more than the mechanical aspects of the study.

One primary way I tried to achieve trustworthiness was by the length of time I spent in the site. Over the course of the school year, I made many visits to the site and conducted lots of interviews. I think that in some ways, the participants came to see me as an “insider.” I knew what was happening in their classes and relationship, and was a regular. Their interactions with me became a routine part of their normal activities. Though I would not say that I achieved a truly emic status in either relationship, the high level of familiarity contributed to the richness of the data I was able to obtain.

A second technique I used was member checking. I wanted to share my developing understandings with participants. Clandinin and Connelly advocate a certain kind of member checking in narrative research (2000). Rather than just asking the participant, “Is this what you said,” researchers ask “something more global and human: Is this you? Do you see yourself

here? Is this the character you want to be when this is read by others?" (p. 148). By returning to participants with portraits and narratives constructed using their words, I attempted to give them a voice in how they were portrayed.

One final aspect that must be considered when addressing the trustworthiness of the study is the subjectivities that the researcher brings to the work. My own subjectivities surrounding this work are detailed in the following section.

Subjectivities. A description of my own experiences with mentoring is important in outlining my subjectivities related to this study. As a high school teacher, I had a mentor of my own. This was a woman with a personality very different from my own who I feared in many ways. I appreciated the fact that she wanted to help me, but did not feel that we had the personal connection described in many studies about mentoring. It was not a bad relationship, but it also was not one that contributed to my understandings of science teaching. I also had experience working with the science mentor training program in my own department. I had conducted small scale studies where I visited people who had completed our program and asked about their experiences. In each case, I received glowing reports about the relationships. And yet, I knew from my own experience that these relationships were not always easy. I went into the study determined to get to the bottom of "what was really happening" in these relationships.

As the study progressed, I encountered a second subjectivity that must be discussed. Because I spent so much time with the participants, I developed close relationships with most of them. I deeply appreciate the amount of time and energy they have devoted to helping me with this work. For that reason, I feel very protective of how they are portrayed to outsiders. As people read these narratives, I think it is very easy to criticize certain aspects of some of the behaviors. My thoughts about the balance between responsibility to my participants and

accuracy in representing their experiences could not help but influence the choice of narratives to include.

Introduction to the Participants

Up to this point in the study, the participants have been described in abstract terms such as mentors, or participants in an alternative certification program. Details have been given about how they were selected, how interviews and observations were conducted, and how narratives were constructed, but we do not know them as individuals. The purpose of the introductions that follow is to let the reader get a glimpse of who these people are as science teachers and their views on the subject of mentoring before the study began. We can now attach names and ideas to previously anonymous participants. These narratives can serve as a reference point for participants initial beliefs; they are informative for understanding the experiences that follow in subsequent chapters. First are the descriptions for one pair of participants, Melanie and Patti, followed by portraits of the second pair, Kevin and Jodi. All names are pseudonyms.

Melanie

Melanie is a veteran science teacher with five years of science teaching experience at the high school level. She works in a school with approximately 600 students located on the outskirts of a large metropolitan area. In the past, Melanie has served as a cheerleading coach at her school and has won teacher of the year honors. This experience was Melanie's second serving as a mentor for a science teacher intern, though she has mentored several new teachers at her school. On a typical afternoon in Melanie's room, students stop by to say hello, complete make-up work, or to get help on topics they did not understand from the day's lesson. During the period of the study, Melanie served as a mentor to Patti. In the following sections, Melanie explains her views on science teaching and mentoring. All words in italics except for those

enclosed in brackets are Melanie's. Bracketed words were changed or added by the researcher. This stylistic convention is used throughout the rest of the dissertation.

Views of science teaching. [My name is Melanie and] this is my sixth year. I think a good science teacher, [or] a good teacher of any subject, has a lot of balance- uses a lot of different methods, all the time, every single day, for every learner: kinesthetic, auditory, visual. I think it's good for them to be able to touch things and do as much as possible. Even if you're having to spend some time lecturing or teaching them about [a topic], it's really good to have something that they have at their desk that they're doing along with you, or that you can pass around. I just think it's really good to teach to all learning styles. And I think great science teachers are the ones that can get kids to figure out things [in] more of an inquiry [way] on their own-[shouldn't] necessarily [say], "This is the way it is, please take my word for it. "I'm the ultimate authority." You want them to be the kind of thinkers that start to come to realizations on their own. They just remember it longer, it makes total sense when they're doing it and they don't just have to take your word for it. I don't think we want to put people out into society that just take people's word for everything. We want people to be able to think for themselves. You have to continually hold them accountable for what they're doing, and give them challenging problems that make them really think about whatever lesson you're teaching them A good science teacher is extremely enthusiastic about what he or she is doing.

Reasons to be a mentor. I think [being a mentor] is very important. I think it's probably one of the most important things I could do. It's something I have the least amount of time for, but in the grand scheme of what I stand for in education and what I think other people should stand for, how can you not agree to try to help somebody stay

[in teaching]? Once they've been mentored, they will stay in that field- they have a chance of staying in the field much longer than they would if they didn't have anybody to help them through their first year or two. I know that when I first started teaching, I didn't really have anybody to do that for me, and the only reason I probably stayed in teaching was because my mom was a principal. I could ask her a lot of questions. She would help me through some situations. I can remember not having an actual mentor assigned from the school, but seeking help from different places where I knew I could get it. But if I had had somebody whose room was right beside me, that taught the same thing I did, it would have been a lot easier on me. It was a good year and it was a great school, but I think it would have been better if I'd had a mentor. That was a big reason that I wanted to help do this.

[Once] I got more into [mentoring], I saw the statistics of how many teachers drop out of the profession if they're not helped through those first few years. I was amazed at the numbers-like 80% within 10 years leave if they don't have somebody helping them. I couldn't believe it, but I can see it. There've [sic] been plenty of days that I thought I'm just not gonna come back next year; this is not worth it, but you get over it. I have warm feelings about [mentoring]. I feel like it's very important and it's very, very hard to do.

I think [being a mentor] helps me reflect on my own teaching. It's a selfish benefit, but when you're trying to help somebody understand something, [it makes you think about what you're doing]. When you're asking other people to hold themselves accountable to a certain standard, you have to hold yourself to that same standard and it pushes you to be a better teacher I think. I like the communication and the camaraderie

with the university. I like to keep that door open. But, I get a lot of personal benefits as far as my own teaching, that's really important to me.

Role of the mentor. I think my job is to get [the protégé] to a place where they are completely competent on their own, where they feel comfortable answering questions about content, where they feel comfortable with their own knowledge. [I want them to] feel so good about what they're doing that they don't have to use the book labs, or the book homework sheets. They need to go for it, because that's where a lot of real teaching takes place. I really would like to get them to that point. Of course, in the beginning everybody's just so overwhelmed that it's good to depend on the materials that are given to you as far as the stuff that comes out of the book. The most important thing is that they learn how to elicit excitement from their students [for] what they're doing. Of course, students are going to love it if you teach to all learning styles and if you're constantly giving them something to figure out. It's a big job and there's no one way to do it.

I'm a big organization freak. I really want my [protégé] to learn how to be organized and how to be completely efficient. Efficiency is the key; a good teacher has a great system and knows where everything is at all times. Like today, in biology we were doing water and polarity and hydrogen bonding. To me, I should have a little folder with a slew of stuff in there that I could do, or show, or talk about.

I think professionalism is defined by how you act with other people and the kids. I want [the protégé] to get to a point where they know how to interact with other professionals. Adults get snippy with each other sometimes and you have to be able to let everything roll off your back. They should know how to interact with students on a very professional basis and know how to elicit not only good behavior in class, [but also] a

real desire to learn. Teaching is hard on your ego, the kids don't hesitate to tell you anything- how your hair looks or what you're wearing. You can't just say whatever comes to mind. People think that if you make smart comments to the kids, they'll [think] you're cool. But they really respect the teachers that are completely professional. They won't admit it, but they do. They try harder on their homework and everything that you ask them to do. [You can] never let your guard down and never let them see where your buttons are. Sometimes they'll say things just to see if it would bother you, but I never let it look like anything is bothering me because they just won't do it anymore if they don't get any kind of response.

Sometimes high school students love you too much. They'll try to get too friendly and you have to be adult enough to [draw the line]. [They want to] talk about other teachers, and you can't let them.

Role of the protégé. I think the [protégé's] job is to come in and learn as much as possible. It's sort of a balance. They need to come in and learn as much as they can from the [mentor] and then learn how to develop their own ideas. I think that they're there to figure out what constitutes good and bad teaching and how [they can] start to develop [their] own personal [style], because everybody's different. The way that I see good teaching is slightly different from the way they're going to see it and they need to develop their own idea, their own personality with the kids. They can't copy mine. I certainly don't think that they're there to learn how to copy from me. I just need to help them find themselves. [They should ask themselves], "How do I get the student to learn as much as possible and really enjoy it?" They need to learn all the students and how they react in different situations.

If you get right down to it- initial responsibilities, I think they should come in and start observing and taking some notes and maybe trying to figure out what constitutes good teaching. And then later on, I think it's good for them to start developing some short lessons, and start teaching those and get to know the students real well. I certainly don't think that they're there [to be my secretary], I would never hand anybody a stack of paper's to grade. To me, they're in there to learn about teaching. They need to maximize that however they can. [They need to figure out] how [what they are seeing] applies to them. Their job is really to learn as much as possible and get absolutely as much experience as they can and try to get a feel of what it would be like were they on their own.

It makes it a lot easier if they know the content really well and there [are] no issues on that. At least if they're only a little confused about something, they can clear it up. Of course I will help them, but it really makes it easier if I don't have to reteach anything to them. I really expect them to know what they're talking about.

[It's important] to have a good attitude and to really be enthusiastic. I like to see enthusiastic teachers. It's scary at first but you find yourself comfortable with the kids after a while, and you really do need to get excited about what you're doing, because they won't if you don't.

They [should] come in with a work ethic and be willing to try new things. I stay at school until five and six o'clock all the time. I [may] know I have a lab that we did last year, but I get bored myself. I have to switch things around. I will sit down and find something new [or] make up something new that gets the exact same concept across. I can't repeat stuff a lot. At first, you just want [to use] what you have, but I think you

need to be willing to try new things and to make yourself grow. They also need to make themselves grow. It's hard, but I think it's really the only way to become a better teacher. You have to keep pushing yourself to do new things and if you don't try it and you don't fail at some of the things, then you're never going to know if you could be better. The kids really appreciate it; they like doing stuff that's new and different that you didn't do last year. I have kids coming by all the time- "We didn't do that last year." I [say], "Well, it gets better every year."

Possible difficulties involved with being a mentor. I've only had one student teacher prior to this year and I've also had some new teachers that I've helped, so I'm still going to be cutting my teeth on the new student teacher this year. Maybe professionalism is a big deal because I was having a hard time getting it out of my student teacher last year. I'm talking through colored glasses, but I just felt like she was really immature. It was hard for me to tell somebody what their weaknesses were. It's not real hard if you're just talking about a lesson. But talking about what I consider personality weaknesses, where [she was] just immature, was very hard for me last year. She would get her feelings hurt really bad, so it made it even harder. When I would say something and she would get upset, [it was difficult]. I never would criticize but just try to say, "Here's what your strengths are and this is what you did well, but this is what we need to focus on." I just had a hard time doing that and reading her, because she was getting her feelings hurt a lot. I think it was hard at first for me to pick out what she was doing well with the lesson.

I know there are some things unconsciously that I may do. [The projector is one side of the room], and [it may turn out that] I'm talking to this side of the room and

ignoring [the other] side of the room. So when I would observe her, if she was doing the same thing, I would tell her, but I didn't realize I was doing the same thing. That was hard because I'm sure she thought I was talking out of both sides of my mouth.

I think that it's hard sometimes to get [the protégé] to be on her own. I know that her supervisor last year kept telling her [not to rely so heavily on] stuff from the book. We want to see what kind of lab you're coming up with to help them think through this. She just could not get that through her head. She said, "That's what it's there for." And I understood where the supervisor was coming from, wanting her to go out a little bit on her own and try some things. It was hard to get her to do that. What I wish I had done was say, "You're on your own and of course I'm going to help you develop through it. Show it to me ahead of time." Then I could go back and show her [what] probably needed to be changed and why. Then on the back end before she left, let her copy anything I have. [I should have said], "Spend your time and go through it this summer. You can use what you want to, but now you've got your own stuff too." I would have given her anything at the end, but I wish that I had left her a little bit more on her own in that respect. And I will definitely probably do that this year.

[This year, she is] a non-traditional student. I'm wondering if she is an adult with a family. I can work with anybody, I really can. But I thought it might be kind of awkward to work with somebody that is a lot older than me who has a family.

Patti

Patti was a friendly, talkative woman whose age was somewhere in her late thirties to early thirties. She had experience in several health related fields and was eager and excited to start her internship in Melanie's classroom.

Path into the teaching profession. [My name is Patti and my route into teaching is somewhat] convoluted, I have a degree in respiratory therapy from the Medical College and a minor in life science. After I finished at Medical College, I worked in a hospital for two years and then was in pharmaceutical sales for about seven years. The pharmaceutical company that I worked for downsized, so my territory got consolidated and I looked for something else. [I] worked for a medical waste company for three years, and then a medical staffing company. [Both were] interesting and very entrepreneurial, which I liked. [Then I] helped a friend of mine with marketing and things for his business, but I was ready to do something else and I started looking seriously at going back to school.

About a year ago, [there was] all the media hype about [being able to] go to school for a month and then teach. I found out that's not the case, but I was still interested in teaching. I found out about a program at State College called Health Occupations Education. I went to several job fairs and met lots of people, but I found out there's not much demand for that. The only openings I could find were [far from my home]. I really didn't want to drive that far.

I found out about this program which was neat. I felt frustrated that it seemed that there were different ways to go about [getting certified]-other than just going to school, majoring in education, getting out, teaching, then getting your Master's- which is what some people do. [I decided to participate in the internship program in PACSS] because I had such a bad experience with the Health Occupations experience that I wasn't sure how that would work, if there would be an opening to teach provisionally in the Fall. I just wanted to get started. The system doesn't work real well as far as people

getting in and getting their provisional certificate if they don't have a degree in a science. I really didn't want to be thrown out there, not knowing anything about teaching and sink or swim, and not have a good experience. Everyone's different and maybe it would have worked out, but at the same time I really think that the mentoring will be much more beneficial to me because I can be under someone's guidance and direction. I can be shown the right way to do things and not become frustrated. I will also be getting a wonderful review of biology and I'll have someone to ask questions of, to bounce things off of, to help prepare for the Praxis II. All of those things make it a much better fit for me.

Role of the protégé. My job would be to do everything I can to make sure that I'm prepared and make sure that I'm willing to learn, and see how she does things, and see what works well in her situation-to observe and take in all I can to utilize it effectively when I have my own classroom to teach and reach all class members. I have positive expectations. I want to have a good experience and learn and do a good job. I like science, it's interesting. It will all come together.

Concerns about mentoring. I don't think [mentoring] would be a problem if it wasn't pharmaceutical sales. In pharmaceutical sales, what is done on a day-to-day basis [by the salespeople] versus what [higher-ups in the company] thought should be done, or how it should be done was very ivory tower, not going to happen. What I'm trying to say is in teaching hopefully, it will be more reality-based. What I expect from my mentor is to really learn how to effectively teach people and reach them, managing a classroom and how evidently from the very first day things need to be laid out-what's expected. Maybe children are even looking for that guidance to feel secure and know

what they're supposed to do. It's really important to make sure everything's ready or you can get off into chaos and it's very disruptive. [I hope the experience] helps me learn what happens in a [science class] and how you are supposed to do things, something that will have meaning and real world connotations.

I've worked in so many different situations now, I'm not afraid to go to work in new places. I'm really not worried about getting along with my mentor, but I don't want to get disillusioned and not want to teach. I want to have a good experience, but I know it's not going to be perfect. I don't want the kind of experience where people just give up, and they go into a stage where survival is the instinct. I want to help her, I don't want to take too much of her time and be a burden. I want to teach, and I want to be able to do well.

Views of Science Teaching. From reading the book and going to class, I think things are completely different from either going to college, or when I went to high school. I may not remember this correctly, but I remember roll call, and notes on the board, and that's not the way you're supposed to teach anymore. I remember some labs and things, but the focus was to read the chapters, have lecture and notes, and then have a test.

Now, you don't take roll because one, it's a waste of time, and two, it's an opportunity for them to act up. Now, you have activities that they do on their own or in groups. The whole concept has changed and you have to be real aware of different levels of students and what they're able to do, and you have to keep things changing to keep them interested and involved.

[I picture] a nice, organized classroom, not too cluttered, but not bare. I think you should personalize it, if we're doing plants, bring in pictures or leaves that they collect. Maybe have them bring in things and you bring in things. If you were doing Kingdom, Phylum, Class and Species, you could bring in sea shells and different things to get them interested. You don't lecture anymore, but try to make things interesting so that the students think on their own and develop ideas and concepts so they understand the material. You should try to teach it personally in a way that they would understand it and be interested in it.

Kevin

Kevin was a veteran middle and high school teacher with many years of teaching experience. The school where he taught during the project was located outside a large metropolitan area and had over 3000 students. A trip to Kevin's classroom was like a visit to the zoo. In his room were a salt water aquarium with a shark, a terrarium with a tarantula, a second terrarium with a turtle, and a cage with a snake. The back wall of the classroom was lined with aquaria full of fish for an on-going aquaculture project. Students stopped by to help care for the animals and visit with Kevin. Paper mache models of fish and cells hung from the ceiling. Digital camera pictures of overnight student field trips to a coastal marine center covered the cabinets along the wall. Kevin served as Jodi's mentor during the 2002-2003 school year.

Teaching experience. [My name is Kevin and] this is my eighteenth year. I've taught all my life-swim team coach and swim lessons then in college I was a ski instructor. I was a biology major [and] didn't know what to do after I graduated college. [I went to an] environmental education center, saw I liked teaching, but it didn't pay any money so I went back to the [university], got my teacher's certificate, and have been in

[this] county ever since. Middle school for the first seven years, got burned out. Went to the zoo for 4 months and then got into high school. Biology [is] my strong point. I've always been a kid that collects animals and I still collect animals. That's what I like. That's what motivates me [and] keeps me interested.

View of science teaching. Several things come to mind. It's something that's gonna engage the students, show them a wow factor, motivating them to learn or ask questions why. If you can plan activities day by day where they can investigate things and learn things on their own, I think you have a good science teacher. Here, we have to cover the mandated curriculum, but we work that in somehow. I've really gone big on inquiry this year. I've gotten rid of the cookbook labs. I'm using the materials from the cookbook labs and just giving them to 'em and tell 'em - figure out how does this apply to what we're learning. I see the teacher as a facilitator, but they're asking questions all the time. [I want the students] actively participating and not sitting there reading the book and answering questions and doing that kind of stuff. We are just doing different things. Now instead of writing a two page report [about a famous scientist], we're in the media center and they are trying to find a real life scientist and they have to make an email connection. If they can do that, then they have to do an email interview, instead of writing a two page paper. Ask them questions that you want to know about.

Reasons to be a mentor. I took [a mentor-training] class and we needed to get a protégé. That's pretty much what happened last year. Now that I've got my certificate, I don't want to waste the class that I had. I had a good experience last time. I think [I] learned things- stuff not to do, stuff to do, how to communicate better, how to share things, how to motivate them to put in the paperwork so they can get a job earlier,

learning the “tricks of the trade” you want to add. I’ve improved from last year. I want to add that and make it better for the next person. Plus, you have that concern in the back of your head about how we need teachers, especially good science teachers. I guess that’s a selfish reason for the school, if I can find good people mentoring, I want to recommend them to get hired here so we have more people. That’s a secondary thing, but still.

Role of the mentor. Primarily, I want to expose them to what is good and bad [teaching], and then secondly, I want to expose them to the job and all the things that go into the job. My primary job is to show them the difference between how teaching could be and how it should be. Meaning, we could give them worksheets. I think anybody could do that. As long as you’re a task manager, you can get out a calendar, write down here’s chapter one, here’s chapter two, here’s chapter three. Let’s do worksheets. Let’s do a lab. Let’s do a quiz. Let’s do a test. Anybody can do that. It’s so much more rewarding if you change that and think of something that makes the kids learn, makes them think, engages the kids where they’re actually learning the curriculum. And I’m big on real-life applications. If I can find a real-life application, let’s do that. Let’s make it fun for everybody in the classroom. I think if I show the protégé that that is the better road to take then I’m making them a better science teacher. [My job is] to expose them to the job, show them we can do it this way. This is easy on you, but you might have a lot more kids struggling, whereas if you do it this way and make it more exciting and fun, you’re going to have [fewer problems]. I think that’s the main thing.

I [also] show them what’s required by our county and all of the stuff that goes into [teaching]. I do a whole lot more work as a school teacher than I did as a business

person and I don't know if they realize the amount of work that happens-the mandated curriculum we have, and all of the policies, and all of the papers, why we do things, how we do things, and how to get around the building, learn all of the logistics of the daily grind of being in school. [I show them about] keeping track of parents. I'm real pro-active in talking to parents and emailing home and sending home rewards and letters, so they can see that. [They will] also learn a lot of biology just by being exposed to it and exposing the kids to it. [My role is to] be a facilitator, and answer questions, try and help them get a job, give them guidance, expose them to the job and let them get practice doing it. [I also want to] make sure they are not bored. I don't want them just to sit here and think they're [not] valued, because they're here to learn.

Role of the protégé. [The protégé's job is] to be a sponge. They really have to absorb it. They have to soak everything in. I'm dealing with 9th graders who have good days and bad days every other day of the year. That's my job, I have to go with the punches as far as the students go. [I expect the protégé] to give some effort and talk about things and be inquisitive and ask questions. Why did you do this? What would happen if we did this instead? I don't want to call it assertiveness but, but be daring enough to try something new. If they come in with that attitude where they think this is a great opportunity, I'm going to learn a lot here; I'm going to try to stretch myself and make myself a better teacher. That would solve the problem right there. If there were any problems, just coming in with that attitude, you'd be able to do the job basically. One of my expectations is that they have to know the content- don't have to worry about if they're saying the right thing, come in here and talk about it and discuss it and give examples if the kids bring something up.

Benefits of being a mentor. It makes your teaching more valuable because you reflect about what you're doing. You tell them why you do things, and that helps you translate it to yourself so you understand why. Before I went through mentor training, I never did that, I never reflected. That's the biggest thing I got out of the training thing is how to reflect. I'm not teaching anything like I used to. I was one of those-one year at a time, and teach it 20 times or 30 times and then you retire. That's not what it's about. It's that you go with the flow and if the kids are interested in it, we talk about it. It's a lot different and it's a lot more interesting for me.

We both learn working with each other. It's a learning process. Hopefully, I'm going to learn things. [My interns] from the past, they've given me so many suggestions and activities. And because they're in school and I'm in school, we're getting new ideas all the time. It's a good chance to try things out or share information. It's just a lot more pleasant working with somebody and seeing them grow. You're telling them, "maybe you should try this way." Then the next period they can try it that way and you can see it work. That helps them out. It's just a collaboration that makes your teaching more valuable. I had a doctor, a microbiology doctor that needed a teaching certificate. He knows more biology than I do. I didn't need to teach him the content. I needed to teach him about the kids and motivating the kids. I guess it's more like showing him how to sell something, because you're selling the topic every single day. It's kind of like we're both [protégés] because I'm learning from him. I try to do a team concept where what they have to say is just as important. [It's] two way learning. We spend a lot of time collaborating to show them what can get done [in] a team aspect of teaching.

Concerns about mentoring. [The concerns that I have] are just the uncertainty of where the person is coming from, what they're expectations are, what they want to get out of the program. They are supposed to meet 20 hours a week in the classroom for the program. Do they want to put in a little bit more so we can have common planning time or do they only want to put in [the minimum? Sometimes, you have to have] hard conversations. You have to ask point blank, "Are you ready to go, or are you not ready to go?" But I guess I'm laid back enough where I can adapt to them.

Jodi

Jodi was a vivacious woman in her late thirties. She often wore the suits that were a remnant of her previous career as a retail store manager to her internship in Kevin's classroom. Jodi enjoyed technology and liked to share her latest creations on her palm pilot and website during my visits. Jodi often told hilarious stories of things that happened during the internship that were not part of the research questions for the study, but made visits with her fun.

Path Into Teaching. [My name is Jodi and] I am 38 years old. When I was in high school, I did have an interest in science, but I didn't have any teachers that were really fabulous. I never really got that spark happening. I graduated high school 6 months early. [I] didn't know what to pursue as far as my life, and I was so excited to just get out there and get into the real world that I could hardly stand it. I [went] to [a large western university] and majored in mechanical engineering and minored in materials for a year. I decided that I wanted to pursue my more creative side, so I went to the Fashion Institute for a year. I decided that if I was gonna do that, I might as well get on out there and do it, so I did. I went into retail, and quickly moved up the ladder and was a store manager within two or three years and spent the rest of my years as a store manager.

I really enjoyed the training, taking someone and really helping them become their full potential, that was my goal. After 10 or 12 years, I realized that people are only gonna progress as far as they want to, not as far as you think they can. I think I got a little discouraged or [thought] it's time to do something else. I wanted to do something with my mind again, so I thought well, it's time for me to go back to college.

I love animals, so I started out being pre-vet and took all the science classes and absolutely loved them, just got hooked on them, but really kinda came to the decision that being a vet would be the same thing as running a retail store, you've just got pets coming in and out all day instead of people. I wanted to go into something that was gonna be more [of] an applied science situation, that would be I thought more challenging intellectually, so I picked up environmental health science as a minor. That's my love, safety issues and protecting people. I think that all goes back to my management instincts where I want to take care of people and make sure they're okay.

[After I graduated from college], I worked in an environmental lab for a year. Started out in their quality assurance department and four days later they promoted me to department manager. People love to put me in charge. I don't know if it's my personality, if I'm just a very aggressive person or if I just carry myself like I know what I'm doing, but I always end up in those positions. That really wasn't what I was searching for. I would have been happy to be on an assembly line running the tests, but [I] worked 75-80 hours a week. [I] decided at my age I really wanted a balance in my life. That's a little bit too much to give them.

So, I was talking to my friend, and he says, "Well you love science and you want to keep learning, why don't you just teach it." That's when I decided to go back to

school. I almost felt it was a little bit late in my life to be trying to start a career in the sciences. I feel like I would be better served by being able to get young people excited about it at the age where they can get out there and start their lives into it, rather than being halfway through their lives before learning that's really what their path is. That's kinda my motivation with the teaching aspect of it.

Decision to be in internship program. I have really high standards, and I have very high ethics. Although I could have done provisional teaching, I really didn't feel like they would be getting their money's worth from me. I like to go into a situation being prepared to handle it properly. I don't have children, I have the neighbor kids that I love, but that's not the same as being in an academic situation with them. I felt like it would be more fair to the kids that I'd be teaching and to myself for not putting that kind of pressure and stress [on myself] right from the beginning. I would rather do an internship, observe and learn; then when I step into that position as a paid person, I would feel confident that what I would be able to give them would be what they were expecting from me.

I don't have too many predefined notions. I try to keep it that way because I find that if you get your mind set on how you think something should be before you are actually faced with a situation, then you have a tendency to be not happy with the situation as it turns out to be. I try to keep an open mind and a very positive outlook. I don't really expect anything until I go in there and am in the situation and can assess it. I hope that there will be a time of observation before he throws me [in] and puts the class in my hands. I like to be prepared and I like to feel confident of my situation before I undertake something. If you can't do something well, don't do it at all is my attitude. So I

hope I won't be put into a situation until I feel a little bit more comfortable with the scenario. If I [am], then I'll go with it.

[I do have one concern about the situation]. Having been in retail, most of my supervisors have been female. I have worked with men, I have had supervisors that are guys, but men do think differently than women.

Role of the mentor. I am really interested in [learning strategies] for presenting specific materials, because there are certain materials that are more effective when they are presented a certain way. What I'm looking for from a mentor is someone who sets an excellent example and then is available when I have questions. I don't think it's his role as a mentor to be responsible for my learning. It's up to me to learn and ask questions. I'm not expecting someone to take me by the hand and coddle me through it all. My job is to learn and support him and make his job as easy as possible. I hope that I will be able to contribute and not hinder.

[I feel that there are things that I have to bring to teaching from my previous careers]. I have skills that a lot of the people who are just coming out don't have. I've worked with the public for years and years. People don't scare me. Having been a manager for so long, I'm attuned to watching signals. Classroom management-young people have a lot of questions and concerns and are scared about managing their classroom. I [feel that] I know how to deal with people.

View of teaching. I think [an important skill for any teacher to have is the] ability to capture the interest of the people that you're teaching and keep it, and be able to make the changes that you need to keep their interest as you go along. My experience with science teachers in the past was that it was a dry presentation, and I'm not a dry person.

In a lecture situation, hopefully you can be animated enough to present it in a way that is interesting and involves the class. As a trainer, I always [did] a lot of open conversations, keeping them involved verbally is an important part. I do have a tight reign on [the] situation; I always run a very controlled environment, flexible and comfortable, but still controlled. Incorporating observations and doing along with talking is, I think very effective. If I didn't have [access to a lab], I would have some visual things for them that they could use as a reference, or pass around. It is much harder to keep control over a group if they're moving around but there're things that can be learned that way, that [they] wouldn't be able to learn from their seats.

Summary and Preview

This chapter provided a description of the methodological framework of narrative inquiry which guided this study along with a rationale for its use. A description of the timeline for the study, methods of data collection, and methods of data analysis were detailed along with examples of how they were used. The chapter concluded with narrative portraits of each of the four study participants. Chapters Four and Five present the two cases investigated in the study. Chapter Four contains the case outlining Melanie and Patti's experiences in relation to the four research questions. Chapter Five shares those for Kevin and Jodi.

CHAPTER 4

MELANIE AND PATTI

This chapter is organized to chronicle Melanie and Patti's experiences in their mentoring relationship within the parameters of the four research questions. Each question heads its own section with supportive text and narratives included. The order of the questions is as follows.

- 1) What is the nature of the advice and guidance given by the science mentor?
- 2) What do the mentor and protégé each gain from the relationship?
- 3) What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them?
- 4) How does the relationship change over the period of the study?

Advice Given

During the course of Patti's internship, there were many opportunities to observe interactions and discuss instances where Melanie provided Patti with advice on a variety of subjects. This advice can be tied to frameworks explicating areas of new teacher development. Borko and Putnam (1996) used a system that included general pedagogical knowledge, pedagogical content knowledge, and subject matter knowledge to organize research relating to learning to teach. They define general pedagogical knowledge as "knowledge and beliefs about teaching, learning, and learners that transcend subject matter domains" (p. 675). Classroom management, instructional strategies for conducting lessons, and knowledge about learners, and how they learn constitute topics in this domain. These authors define pedagogical content knowledge as the ways of representing specific content so that others can understand it. Included

in this domain are knowledge of the curriculum of a subject, how students learn that subject, and common student misunderstandings of topics within that subject (Borko & Putnam, 1996). In interactions between Melanie and Patti, the majority of the conversations focused on general pedagogical knowledge. Melanie and Patti, however, had other discussions that focused on science-specific pedagogical concerns. The following sections provide highlights of their conversations and the topics they addressed.

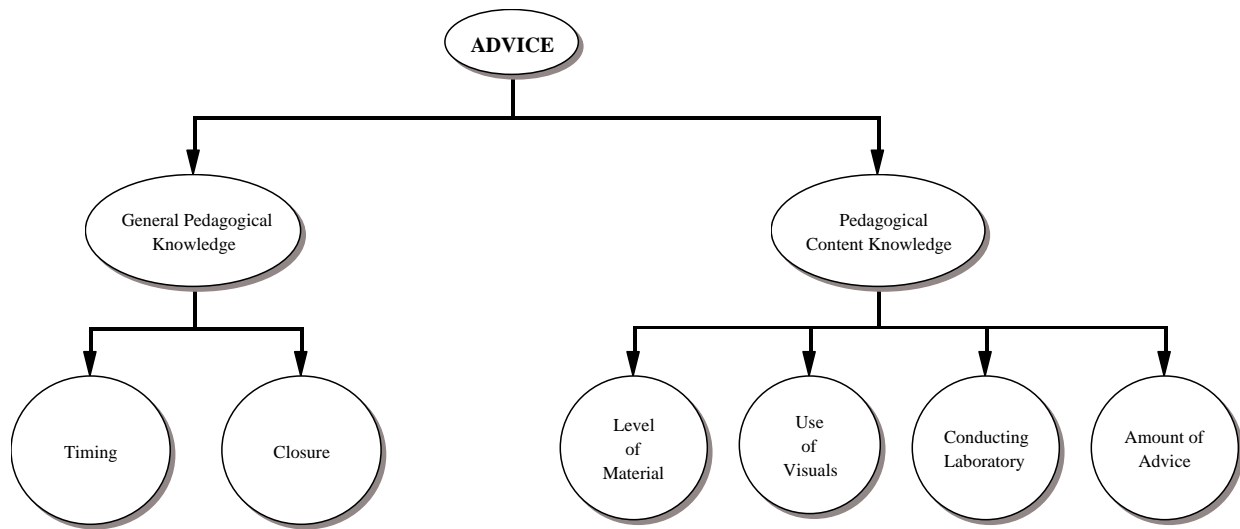


Figure 1. Melanie and Patti-Summary of Advice Given

General Pedagogical Knowledge

Melanie and Patti’s conversations pertaining to general pedagogical knowledge focused on four particular domains: preparing for lessons, engaging students, assessing students, and managing the classroom. Melanie and Patti addressed these topics in multiple conversations throughout the internship as they worked together to facilitate Patti’s understanding of science teaching.

Preparing for Lessons. For Melanie, it was very important that Patti be thoroughly prepared for all aspects of her lessons including technology, materials, and content. Melanie

wanted Patti to have lessons completed in advance so the two could discuss lessons before Patti implemented them.

Melanie: I made a big point first period to say, you have to be ready. If you want to give them homework, you've got to have it ready the day before, copied and everything. If you want to show a clip, you've got to have it all set-up and previewed. When you come back on Tuesday, have the whole rest of the week of products-everything you want to do. Show me, and we'll adjust, edit, go over them-talk about what would be good. My hope is that in the future when you're designing things, you'll think about things we've done in the past and say-oh, you know the best way to do this would probably be this.

Patti recognized that preparation was an important consideration for Melanie. Initially, Patti did not understand why Melanie was so thorough, but over the course of the internship, she came to understand Melanie's viewpoint.

Patti: She likes everything laid out, looked at, analyzed, possible problems [addressed]. [She wants to] make sure it's going to work.

Engaging students. Many discussions between Melanie and Patti focused on Patti's ability to plan and conduct lessons that were engaging for students. Foci of these conversations were: combating student boredom, focusing on student understanding, and using a variety of instructional strategies.

One concern for Melanie was the students' level of engagement with Patti's lessons. Melanie felt that the students were sometimes bored and she wanted Patti to use verbal and non-verbal cues from students and adjust her teaching accordingly. In the following interview excerpts, Melanie describes conversations with Patti about student boredom.

Melanie: *I told her one day, I just said, “They’re bored. They don’t like it. They don’t like the way you are saying things. You’re monotone, you’re standing in one place, and it’s basically lecture.” I really kind of let her have it that day, but I thought [my] other suggestions weren’t working. I tried to talk to her about being enthusiastic. She was so worried about getting everything perfect and word for word, and not missing out on one little thing, that [her teaching] had no life of its own. We had a real strong talk last Thursday. That was the day that five people put their head down and she didn’t say anything to them. I said, “They’re bored. You need to look at their faces [and] take some cues.”*

I would like for [Patti] to learn to teach thinking about them and not her. I always say to her, “Please keep them in mind. Please keep them in mind.” One of the things that I have continued to try to get her to do is keep their minds going the whole time, not just copying something, or not just being told something, but letting them try to do as much as they can. I just want her to look at what she’s chosen and foresee how [it] will go over. Just keep them in mind, do something that stimulates their thinking all the time and not just listening.

In interviews, Patti described her own interpretations of conversations with Melanie about making her lessons more interesting.

Patti: *[Melanie] said, “This is not a college lecture. You don’t have a lot of range [with] your voice. You need more inflection, more enthusiasm. You need to get them really involved.” Melanie even said, “If you were a student, would you want yourself as a teacher?” She [told me] I needed to tape record myself because I’m not real loud and sometimes I guess I talk matter-of-factly. I’m not real dramatic.*

In several conferences, the pair discussed designing science lessons that would allow students to be actively involved. The following excerpt is typical of these conversations.

Melanie: *Do you have to be the one to tell them everything?*

Patti: *No.*

Melanie: *Anything that they get a chance to talk is good.*

Patti: *[I] can't think of any.*

Melanie: *How about if you put them in groups of three and...each group has one block [with a term] that they have to be able to explain and define? I'm trying to get through [that] it's about them. This is what I want to help you do.*

In the following excerpt from an interview, Melanie described her feelings of trying to help Patti learn to plan for and implement successful lessons after she had spent several months in the internship.

Melanie: *I've tried to leave it open and not tell her what to do because I want her to find her own thing and help guide them along in what's important. If she could just go home and give [her planning] her best stab, the most creative thing she can come up with of how she would want to introduce this to the kids-. I said, "It doesn't have to be perfect, I'm not expecting that, but I need to know that you can do that. Hopefully, we can edit it together and over time you'll feel very confident about your ability [and] ways to present new information."*

When she first started out, she was talking a lot and the lessons were very teacher centered. They weren't focused on ensuring that the students actually were understanding and giving them practice, even if it was just asking them probing

questions. It was kind of like-here's what I know, [do] you have any questions. I really wanted her to figure out some way to ensure that the kids understand what she's doing, come up with some way where she talked minimally, maybe twenty minutes a period, and then left them 20 minutes to practice or do something or model.

Another area of discussion relating to engaging the students was the relationship between how Patti presented content and students' understanding of the material. Melanie wanted Patti to anticipate areas where students would likely face difficulty and plan her instruction accordingly. The following excerpt from fieldnotes illustrates this type of conversation between Melanie and Patti.

Melanie: What I want you to think about [is], "What is the best way to explain this to them?" Think to yourself, "I had a hard time with this concept," but then come up with a little trick to help them, and ask me what I think would work.

Patti: My problem is [that] when I read it, it makes sense to me.

Melanie: It's an anticipatory thing, you'll have to get a feel for it.

Patti: It's hard to pick out what's difficult.

Melanie: That's what you have to do. Go out and find stuff. Sometimes you just have to give them more practice. You can develop your own study guide that's application based.

I don't expect you to come up with it, but use the resources we have here.

Patti understood that to Melanie it was important that all members of the class were involved in any lesson being taught. In one of Melanie's classes there was one group of students who tended to dominate class discussions. Patti was concerned about how to support the enthusiasm that these students displayed, while still allowing other students in the room the chance to participate in discussions and activities. The following fieldnote entry shows how

Melanie advised Patti to handle the situation pertaining to a mitosis skit activity the students did. During the lesson described, Patti implemented Melanie' suggestions.

Patti: *How do you pick the ones to try to include everyone?*

Melanie: *You have that whole foursome of weak students. This is the kind of thing that may help them, intentionally choose some of them.*

Patti: *If they don't volunteer?*

Melanie: *[For example say], "Martha, I need one more girl, why don't you come up here and help me out," or something like that. Don't feel bad. You don't have to please them (group of boys that dominated the class). Say something like, "I'm going to give somebody over here a chance."*

When Patti was asked about what she had learned through her work with Melanie, she indicated that Melanie's exhortations to involve students was advice she was taking.

Patti: *Just like Melanie said, it's all about the kids, whatever works well for them. [I have to] get them to open up and involve everybody in the class, and not just stop when they give the correct answer.*

Over the course of the internship, Melanie stressed the importance of engaging all students in the lessons taught in class. Melanie believed that it was imperative that students be engaged in, and involved with their science lessons. She emphasized that Patti needed to design lessons with this philosophy in mind. While stressing the importance of this idea, Melanie shared specific strategies that would help Patti achieve this goal.

Assessing students. For Melanie, it was important that Patti develop strategies to assess the students' understandings of the content presented each day. She wanted Patti to use this information as she planned subsequent lessons. Melanie shared several possible sources for

assessment. These included: end of class assessment, questioning during lessons, and movement throughout the classroom.

The following excerpt from one set of fieldnotes early in the relationship highlights the types of conversations that Melanie and Patti engaged in relating to the subject of assessment. In the following excerpts, Melanie discussed a particular strategy for measuring student understanding of the lesson. She called this technique “ticket out the door.”

Melanie: You have to [develop] your own way to figure out what they know. You have to pick something to check for understanding. My thing is, when I get to a point and I'm ready to move on after they've done homework and practiced in class, I give them a 10 point quiz, I tell them to number from one to three on their paper.

Patti: Like a pop quiz?

Melanie: Yes. It's three questions I've sat down and [carefully] thought about to see where they are in their thinking. It takes me five minutes to grade 28 because I know what I'm looking for. In reality, it matters nothing to their grade, but I can go through and say 98% get it. Once their understanding reaches that point, [I] can touch on it and then move on to something else.

As Melanie discussed using this assessment strategy of “ticket out the door,” it was important that the questions Patti used be application questions rather than strict recall questions. The following paragraph is a compilation of Melanie’s discussion with Patti about application questions from fieldnotes taken on 02/18/03. The topic of the lesson had been types of symbiotic relationships that could occur between organisms.

Melanie: The best way is to keep it short and simple and give really vivid examples. For the “ticket” quiz, give them one you haven't done before, and don't use the same examples for

each class. Insert more application kinds of questions to push them through what we did today. Use the application to make sure they really understand it. For example, give them one that is not already on your list and have them tell you which [type of relationship] it is and why that's the right answer. Drop them in a new situation and see how they handle it.

In addition to the “ticket out the door” strategy, Melanie encouraged Patti to ask students questions during lessons that she taught. Melanie gave Patti advice on how to use questioning strategies for assessment. The following excerpts from fieldnotes demonstrate the type of advice that Melanie gave.

Melanie: It's a good idea to repeat the correct answer. [The] most important [thing to do] is repeat the correct why-why is it right. [In my notes] I put, repeat the corrected why's for the ones nearly everyone got right.

Melanie cautioned Patti about her tendency to ask the students leading questions.

Melanie: One of the things I wrote down-you were wanting to ask them questions, but they are very leading. By the time you're done with the questions, you've told them the answer.

Another aspect of assessment that was important for Melanie was that Patti gauge the understanding of all of the students in the class, not just ones who were perceived to be high ability students. Melanie suggested methods of assessment other than quizzes. She also wanted Patti to question students during the presentation of the lessons.

Melanie: You want to assess each person's progress, strong and weak. After you've done a couple [of questions] with a strong [student] and a medium [student], pick [a lower student]. You need to assess that level of student too. You can even write it out. You can

call on low to middle to high. I want to give you feedback from lots of sources. Think of application questions [where you] can say, why did you say that?

Monitoring progress during class activities was another source of information about student understanding that Melanie wanted Patti to utilize.

You have to walk around and check everybody for the rest of the period. Make sure they're not talking and that they're doing [the activity]. You need to ensure their understanding before they leave. Make sure they can model this DNA replication.

In her conversations with Patti, Melanie articulated the importance of assessing students' understanding of the material Patti presented. Melanie's suggestions for conducting this assessment included a short quiz at the end of each day, frequent use of questioning during the lesson, and Patti's movement around the room and monitoring students' nonverbal cues.

Managing the classroom. Another major topic of advice in Melanie and Patti's relationship related to general pedagogical knowledge was management of the classroom. Over the course of the internship, Melanie gave Patti advice on several different aspects of management including developing an authoritative presence and using teacher movement and proximity. Melanie provided advice and suggestions pertaining to specific incidents that occurred during classes as well as time management and conducting parent phone calls.

One of the central tenets in Melanie's approach to classroom management involved setting up clear expectations and immediately handling any discipline problems that occurred.

Melanie: It's all in how you start class the first day. [It's] all how you set up expectations. Students may say they don't [want discipline] but they do. If you don't, they punish you for not giving them that.

In a conference in December, Melanie cautioned Patti not to let student behavior get out of control.

Melanie: This is the tip of the iceberg. You can visualize it going way downhill. You can nip it in the bud as soon as they get back, which is what I would recommend to you.

Melanie felt that it was important for the students in her classes to see Patti as an authority figure. She stressed the importance of Patti's responsibility to be a good teacher as one part of classroom management.

Melanie: Personally, I don't want them to be good because you are threatening them. I want them to be good because they want to learn from you.

Melanie wanted Patti to be a concerned and compassionate authority figure, but she wanted it to be clear to students that Patti was in control. Observations over the course of the year illustrate this focus.

Melanie: Be sure you use your teacher voice at all times. We talked about that at lunch. You'll learn something- you command a lot of attention just from the way you talk and look. It takes practice. I was terrible at it at first. Work on your voice, be direct.

Patti: Firm.

Melanie: Firm, stern, and loving at the same time. I realize it's hard to think of a way that you can be all of those at once. Be firm, stern, and direct. When you ask a question, use a compassionate voice. [You don't want to] make them feel like they are stupid. You don't want to give the impression that you're a quiet person and won't [discipline them]. One thing we'll work on over and over is your authoritarian voice. You can get a lot done with the look on your face and the tone in your voice.

In a conference at the end of the first semester, Melanie re-iterated her suggestions about firmness. She felt Patti had not yet reached an appropriate level of firmness in her interactions with students.

Melanie: You really are nice to them. And I'm not a mean person, any one of them will tell you, but there's a firmness factor that needs to come. I've caught you a couple of times saying, "I'll say it nice." There's probably going to come a time when-

Patti: Okay, I'll say it mean.

Melanie: I'm not telling you to be ugly to them but...

Patti: No, I know.

Melanie: In some cases, they really want you to lay the law down. Sometimes they're wanting you to in a way.

Patti: Yeah, maybe they're showing off for their friends or just seeing what they can do.

Melanie: How far they can get.

In addition to advice about maintaining an authoritative presence in the room, Melanie advised Patti about specific procedures and strategies that she could use to manage the classroom. Using movement was one of the primary strategies that Melanie suggested. In reference to one group of students who was particularly disruptive, Melanie gave Patti the following advice.

Melanie: They don't want to be into it. You have to really talk them into it. The only other thing I could think of that would help-I don't think that you should pace. I think that standing up here is fine, but maybe just every once and awhile walk over there. I think it might help a little bit with crowd control.

In several interviews, Patti described advice that Melanie had given her for specific strategies to deal with class disruptions.

Patti: We discussed some management styles and how to deal with problems when they start talking amongst themselves or they're not paying attention, just little things they might do and subtle but appropriate ways to show them that you're in control and that you are going to manage the classroom and not yell or turn off the lights. Melanie was saying, if they start talking amongst themselves, [I] could just walk over in front of their desks, especially if they are in the front row, and just tap lightly on their desks. [She said] they usually stop whatever they are doing without [having to raise your voice]. Melanie said, sometimes she looks at them and they won't stop talking. [Then] she looks at them again. She will stop talking and she will say, "I'm waiting on you. We're all waiting on you." I thought that was effective. I don't think that's ugly.

Melanie advised Patti to be alert to the cues that students gave during lessons so that she could use these to ensure that students were engaged in the lesson.

Melanie: I wrote down cues I need you to start looking for. Seven were [sitting with their heads propped in their hands looking bored]. One student was making a loud yawning noise. As a teacher standing up there, you need to know to look for it. One student went to sleep, others weren't paying attention.

They get that safety zone. Andy was back there doing his geometry. Once he knows [you are] not moving, [he thinks], "I'm just going to get my homework done because I don't want to do it in math class. I'm not getting graded right now." But in a sense, you can make them feel they're being held accountable every minute in class by asking probing questions and walking over near them and things like that. I think that

would make them want to be a little more involved and try harder to learn. You'll get used to looking for their eyes. If they never look up, chances are something else is going on down here that you can't see.

In addition to being firm and alert for student cues, Melanie had suggestions about giving directions for specific activities. Melanie advised Patti to carefully consider the wording of her introduction to the activity so that she would not encourage student misbehavior.

Melanie: Be careful about saying now we're going to do the fun part. It implies two things. It implies that any other kind of normal school is not fun, and the other thing it can imply which can hurt you is [students think], "Oh, we get to act crazy," and it can be a behavioral thing that you can have. It can be frustrating.

Patti: They can get out of hand.

Melanie: It can be frustrating for you. You've gone to all this trouble and they're taking it [that they] can act [anyway they want].

Managing time was one additional aspect of classroom management where Melanie provided Patti with advice. Melanie also gave Patti direction relating to the amount of time they had to spend on certain topics. Patti described an instance where the pair had planned an extensive project using resources in the media center. They had to shorten the activity because of time constraints.

Patti: We had this media week planned. In retrospect, when Melanie looked at it, she [said], "We don't have time to go down there and do this on this day, this day, and this day when other people need to use the media center."

Melanie also directed Patti about how to structure daily lessons to fit into the time allotted for classes. In an interview excerpt, Melanie recounted some of the advice she had given.

Melanie: *I said that I thought it was going to be hard to do all [the activities Patti had planned] in one class [period]. [I asked], how could you make it more focused so the whole class we were focusing on just one thing, it was real broken up.*

Melanie also provided guidance about the length of time to be spent on a given chapter.

Melanie: *I set out a specific number of days. I said, “This is how long you can spend on this. This is when the test will be.” I told her what chapter we were doing because our book is huge.*

As Patti worked to develop a strategy for classroom and behavior management that worked for her, Melanie encouraged parent phone calls as an effective means to bolster Patti’s management repertoire. Melanie described Patti’s experience phoning parents.

Melanie: *I said, have you ever made a parent phone call before. [Patti said], “No.” I said, “Okay why don’t you write this down.” [There were] four steps we went through. I said, “First thing you need to do is introduce yourself and make sure they understand that you are a student teacher and what class you’re in. The second thing you need to do is start out with a compliment. Tell them what their child is good at and what you enjoy about the child. Third thing you need to do is tell them what the problem is. I said, “Don’t belabor it-short, sweet, to the point. Don’t whine about it and don’t list every last little thing that annoys you. Just tell them in general what the problem is. And the fourth thing you need to do is nicely ask them if they could help you out at home.” I [told her] I had never gotten an ugly response if I did it that way.*

Strategies for managing a classroom were an important area of advice for Melanie and Patti. The two had many discussions relating to this topic throughout the course of the internship. Some of the conversations centered on general approaches to classroom management

such as developing an authoritative presence and using teacher movement as a technique. Other conversations focused on specific incidents that occurred in the class and how those should be handled as well as the proper procedures for using parent phone calls as part of a classroom management plan. Finally, Melanie provided Patti with advice about time management both within class periods and across larger domains of time such as a curricular unit.

Pedagogical Content Knowledge

In addition to advice that Melanie provided about general pedagogical issues, she addressed science-specific pedagogical topics as well. Before Patti implemented lessons in Melanie's class, the two discussed her plans and Melanie provided input relating to the specific science concepts to be covered. After the lessons were completed, Melanie shared input pertaining to the lessons. The pair also discussed ways to foster student understanding and conduct laboratory experiences.

Science content to include. Before Patti taught lessons in Melanie's class, the two discussed how the presentation should occur. Melanie tried to help Patti organize logistical aspects of the lesson as well as ensure that the necessary science content was included. The following narratives provide a few examples of the ways that Melanie guided Patti before she taught lessons.

The first presentation that Patti made in Melanie's biology class was a skit that involved having students pretend to be wrestlers in order to model the stages of mitosis. Students moved about the wrestling ring to simulate the movement of chromosomes in the cell that occurs during mitosis. Before Patti enacted the lesson the two discussed both logistical aspects of the classroom, as well as its science content. As the pair began addressing Patti's plan for the skit, they had the following conversation.

Patti: *The different characters imitate professional wrestling. The wrestlers replicate to symbolize what happens when the chromosomes replicate.*

Melanie: *Why do [they] replicate?*

Melanie thought the way Patti described the skit would be confusing for the students. The two decided that by presenting the wrestling match as a tag team event, it would provide a better analogy for DNA replication as an initial step in mitosis. They then moved on to other aspects of the skit including the scientific concepts Melanie wanted addressed in the lesson.

Melanie: *If you would, just include an explanation of haploid and diploid during the wrestling.*

Patti: *Would you want me to do that in the review?*

Melanie: *In the review too, but reinforce it [during the skit].*

Melanie and Patti then had a discussion about whether the centromeres should be represented.

Melanie: *It will be too hard [to include them]. If I thought it would be helpful we would do it, but they don't usually have a problem with that.*

As Patti discussed the skit in a later interview, she reflected on conversations that she and Melanie had prior to the implementation and what they accomplished through those conversations.

Patti: *[The discussions involved] making sure the material was going to be addressed that needed to be covered, [the activity] was going to meet the standards, that they were going to understand the material, and then just adding things to it. [We] made sure we reviewed the steps before they did the skit, and showed the parts of the cell cycle again.*

Later in the year, Melanie and Patti discussed aspects of a lesson pertaining to classification and dichotomous keys. Melanie wanted to ensure that Patti incorporated opportunities for students to apply the information they learned.

Melanie: I just, I want you to be successful. As you're planning for the next chapter think about what worked well, what can I do [to help them learn].

Patti: There was not much time yesterday to start [planning]. I am going to start today.

Melanie: You could go back to the Department of Education website and find any activities. A lot [of what is on the site] will be reinforced- stuff from middle school. We want more applications.

Patti: Problems to solve.

Melanie: Using dichotomous keys. Coming out of this, they need to be able to classify and use a key. If they're really good, [they should] be able to develop their own dichotomous key. That should be the goal.

Melanie then tells Patti about an activity that she has seen relating to this topic that Patti could incorporate into her own lesson.

Melanie: I've used pasta before. Think of something to start it off with a bang. You will probably think about starting with a classification activity and then go from there. It breaks the ice for the chapter and they can see where we're going.

In several instances, as Melanie and Patti discussed Patti's plans for a lesson, Melanie gave specific directions about content that she thought should be included in the lesson. In the following conversation about teaching symbiotic relationships, Melanie provided several examples that she felt students found interesting.

Melanie: *One example [of commensalism] that I give every year-(Melanie begins to draw a picture of a shark with a small fish attached just outside the shark's mouth.)-the small fish on the outside are Remora fish. They don't affect the shark, but they benefit from the fact that he's a messy eater. They can catch bits of food from his meals that flow past. That's a good example to help them remember. How about mutualism?*

Patti: *I'm planning to use lichens as an example.*

Melanie: *With lichens, tell the two organisms. (Melanie then shares another example from entomology.) Termites have to have a certain bacteria in their gut in order to digest wood. As soon as they are born, the mother excretes feces and the babies eat it. There is enough bacteria in that to infect the babies for life. [The students] all say, "Eww gross." They love that.*

During the entire period of the internship in which Patti taught, she and Melanie reviewed her plans prior to implementation. During these conversations Melanie highlighted certain content that should be included in the lessons. In some cases, she provided concrete ideas for how this should occur. Melanie shared specific analogies and examples that she felt would be useful to Patti to help students better understand and remember certain content.

Reflecting on lessons taught. Melanie observed many of the lessons that Patti taught. Afterwards, the two discussed Patti's performance as well as the students' understanding. Melanie used these conferences as an opportunity to offer Patti advice about improvements she could make to future lessons.

A genetics lesson reviewing terminology and introducing Punnett Squares was an early one that Patti taught. Following the lesson, Melanie encouraged Patti to do less talking and have

the students more involved with working genetics problems. The following passage is taken from fieldnotes of the post-observation conference.

Melanie: You could have just started the period with a lot less explanation. You worked very hard to give them what you did today. I don't want to get you started on a bad foot. I don't want to tell you to do less with them. [But] Punnett squares are something that every year they love. They just want to keep doing them and doing them. And really if you had just started class today with a real brief [review] of the difference between homozygous and heterozygous-what really drives it home is doing the Punnett squares and then quizzing them about how many are heterozygous, how many are homozygous. Not what is it, what is it, which is what we kept asking them. But, can you do it and apply it? That will drive it home once they keep doing the squares.

In February Patti taught a lesson about populations, including density-dependent and density-independent factors. The following paragraph is a compilation of the advice that Melanie offered about how the lesson went.

Melanie: It's okay to give little tricks, but telling them [to memorize a list] is not helping them think through it. Give different scenarios and have them think through it. It's okay to use the notes as a guide, or put a definition up there as long as you've talked about it first. When you told them what density-dependent was, you didn't have to put the list up there. Say, "Did you hear that? Did everybody get that?" Be really direct. Make them talk to you. Weed out the frou frou answers, ignore them. Repeat the correct ones loud enough for everyone to hear. Get away from words, relate [the lesson] to math and pictures. Use kids like William as a cue, if he doesn't understand it, the others don't [either].

Another area where Melanie provided Patti with feedback was the structure of her classroom demonstrations. In an interview, Melanie described feedback she had given on some Chemistry demonstrations that Patti conducted.

Melanie: I did give her some feedback in the format of how she was doing the demos. I remember specifically several times-I think she changed it finally. But she would basically say this is what I'm going to do and this is what is going to happen. Instead of saying, here's my materials, okay watch this, and letting them [be surprised], and then her trying to pull out of them, why do you think that happened. That was a big deal to me actually. That was probably the biggest thing that I gave her was having her do the demo, and then try to get them to figure out what happened.

In an interview, Patti indicated that the advice she received from Melanie was helpful. She said,

Patti: It's just practice and really looking at what you've done and being real critical and seeing how [you] can make it better. Melanie is real good- she has good ideas on how to do things or [maybe] we should have done this, or maybe this would work better here. But, I'm getting there.

Reflective conversations between Melanie and Patti occurred after almost every topic that Patti taught. As Melanie provided advice to Patti relating to her lessons, she stressed that Patti should talk less and incorporate more opportunities for students to actively participate in lessons. Melanie reiterated the importance of focusing on student understanding and using a variety of methods.

Fostering student understanding of specific concepts. In conversations between Melanie and Patti, the students' understandings of particular subject matter were important to Melanie. Melanie used her own experience with students to help Patti anticipate where students would

have difficulties. She cautioned Patti to be aware of cues students provided that would help her determine whether they understood material. Melanie reminded Patti to approach her science teaching from the perspective of the students as well as her own perspective as a teacher.

A conversation in December illustrates the type of discussion in which Melanie tried to help Patti anticipate potential areas of student misunderstanding. Melanie and Patti discussed an activity in which students used plastic beads to model the steps of DNA replication. Before the activity, Melanie told Patti that students would want to make another copy of the initial DNA rather than working through all of the steps of replication.

Melanie: What they'll want to do is just make one, and make another one just like it. Help them remember the steps. You need to see them untwist and unzip down the middle.

Watch for things like that. You can even ask, "What's the purpose of unwinding?"

Patti: [If it didn't unzip], it would be awfully hard to replicate and lots of opportunities to make a mistake.

Melanie: Every time you make a point to them, you should justify why it happens. You sometimes want to go through every detail. Just go through 3 or 4 base pairs. Have the nucleotides ready, it cuts down on time. Make the point that there are two new strands [of DNA constructed], half is the old strand, and half is the new strand, but it is still identical. If you want, you can tell them about mutations.

After the DNA replication activity was completed, Melanie and Patti discussed their perceptions of the activity.

Melanie: What did you think of Janet and Karen's DNA replication?

Patti: I told them, "Understand that you have to make another strand of sugars and phosphates."

Melanie: *I think they're missing the idea that it's a whole nucleotide that comes in. When a guanine comes in, a guanine nucleotide comes in. Reinforce that. Pair bases like you said, but add the [sugar and phosphate] strand. Pick someone of average ability and watch their face.*

Focusing on fostering student understanding was an important theme throughout the internship. In an interview in January, Melanie related a conversation in which she stressed the importance of a teacher being able to understand material from the perspective of the students, rather than just understanding the material for themselves.

Melanie: *I said, "I want you to go home and be prepared." Maybe she got the impression that all she needed to do was study and understand [the material] for herself. Today, I hope that it made an impression with her when I said, "That's just the surface job for you. Then go on and think, what kind of questions are they going to ask me? How can I best explain it to them? If I explain it to them in this way, and it doesn't work, what's my back-up explanation? Everything is more important than just understanding it for yourself. Not only [should you] make sure you understand, but how can we anticipate their misconceptions or questions, or be able to explain it so they can get it."*

Patti indicated in an interview that Melanie did help her think through lesson plans from the perspective of student understanding.

Patti: *She'll help me look at things and edit or review, or revise-just look at things and using her knowledge and experience from six years of teaching, see what's going to work, what's not going to work, or maybe areas where students have a hard time understanding something.*

Melanie's advice pertaining to fostering student understanding centered on helping Patti think about her lessons from the perspective of the students. Melanie used her expertise to help Patti anticipate areas of possible misunderstandings for students and use cues given by students to gauge their understanding. The ability to assess lessons from the perspective of student engagement and understanding was crucial to Melanie and she worked to help Patti develop it.

Conducting laboratory experiences. One aspect of teaching unique to science classrooms is the incorporation of laboratories. Melanie and Patti discussed ways to incorporate and implement science laboratories in their classes. During an observation early in the relationship, Melanie explained her rationale for her decision to incorporate an inquiry-type lab into her plans for a particular lesson.

Melanie: I was going to show you, I have several different labs. Sometimes I choose to do one of these (inquiry labs). I feel like they've done [photosynthesis] since elementary school, so it's okay to give them one of these labs where I give them stuff and have them solve problems.

Melanie explained that she had set the stage for the inquiry lab during her class by talking about what you could choose to test and how to collect the data.

Melanie: This is not honors biology. You have to set the stage so they don't get frustrated. If you make them jump too far, it becomes goof-off time. You'll have to find the line when you start teaching.

One laboratory that Patti was primarily responsible for planning and implementing involved extracting DNA from green peas. During the lab, Melanie made a few suggestions such as keeping the alcohol covered so it wouldn't evaporate and handing out bottle brushes so

the students could clean their glassware. After observing the first period Patti conducted the lab, the two had the following exchange.

Melanie: *Is there anything you want to change?*

Patti: *In her directions she (person who shared the lab with Patti) put the shampoo in.*

Melanie: *No, let them do that. What I would change is this graduated cylinder. Swap out all of these for the 150 ml beaker.*

Melanie also pointed out that the other classes during the day would probably finish the lab more quickly and Patti would need to have a way to handle that contingency.

Melanie: *When you have 15 minutes left, what are you going to do?*

Patti: *Probably draw them to order and review the structure of DNA.*

Melanie: *I think that's a great idea. You definitely need to have something.*

In an interview with Melanie after the lab day, she made the following comments related to Patti's reluctance to allow students to have control of the materials for the laboratory.

Melanie: *When she was making the pea mixture, she wanted to go ahead and add almost all of the ingredients and then give them the mixture and all they would have to do is add the alcohol. I talked her into [letting them add the shampoo]. She still didn't want to do it even though I had set it up that way first period. But then she said she could see my point by the end of the day. I talked her into just giving them the bare minimal pea mixture and then giving the kids all the ingredients- let them have more time to read about the detergent and what the detergent does. If she put everything in on her own and just gave them a mixture and all this other stuff, then it doesn't really help them understand what all the ingredients do to the cell and why it actually releases the DNA.*

In the advice that Melanie gave Patti about the DNA extraction lab, the focus was again on maximizing student participation and understanding of the activity. Along with this advice, Melanie addressed areas that could pose management problems and encouraged Patti to develop solutions to them.

Gains as a Result of the Relationship

Melanie and Patti had different perspectives about the gains that had been made as a result of their partnership. Each of these perceptions will be shared in the following sections. Patti's description of her growth as a novice teacher is followed by Melanie's somewhat contradictory view of Patti's progress.

Patti's Perspective

The previous section outlined advice Melanie had given Patti about her teaching. In addition to Melanie's advice, Patti used her observations of Melanie and her experience teaching Melanie's classes to contribute to her knowledge about teaching. Areas where Patti felt she had gained knowledge and understanding as a result of her work with Melanie included a revised view of science teaching and the opportunity to reflect with an experienced mentor about science teaching. Patti believed she made significant progress in her abilities as a science teacher particularly in the area of classroom management.

Changing views of science teaching. Patti felt that her perspective of what it meant to be a science teacher changed during the internship based on observations of Melanie's teaching. Patti began the year using her own experience as a high school and college student as the basis for her thoughts about teaching. She realized that this was not a feasible vision and tried to modify her beliefs accordingly.

Patti: I like the way Melanie teaches. I don't think I ever had a class where the teacher [worked so hard]. I don't remember high school that well, but it seemed like people just used to lecture, and then you did some labs, but it was mostly lecture. It seems a lot more interactive and I hope [the students] can tell that she really does put a lot of effort into the lessons: preparing for the lessons, going over the material and trying to get them to grasp the concepts. It is a lecture, but it's not like she stands up there at the board, or sits and reads. [She] makes it more interactive and interesting. I really do not remember this much interaction, this much trying to get people involved. Nobody cared if you got the material. If you got the material and got [a good grade] on the test, fine. If you didn't, well that was too bad. It's just not what I remember. And I know it works. It takes a lot more time, but if you just stand up there and lecture, then you lose them and you can have discipline problems.

I know I've said it a million times- I wish somebody had cared this much when I went to high school, but if that's what it takes and that's what makes you a better teacher and makes students better students, [then that's what you have to do]. I guess I just thought it was lecture, do some labs, but it's not. I guess I was envisioning what I had learned, or the way I was taught and I realized that wasn't going to work. So I guess, I'm emulating Melanie because I didn't really have a teaching style or the one I was used to doesn't work.

A major component of Melanie's teaching that Patti admired was her determination to involve all of the students in the class in the activities that occurred.

Patti: I just like the way she teaches and I learn from watching her-how she engages the students and makes sure they know things. I feel like it's really helping me hour by hour

just being in the classroom to see how she handles trying to draw in [all of the students]. She wants them to think, at least make an attempt to solve [the problems] and so she really tries to make sure that everybody is involved with the learning process and that they are all trying to work the problems. She's just real good at not making them feel bad or stupid. She wants them all to try and she wants them all to learn. She describes it as, "I want them to feel like it's a warm environment where they can ask questions and not feel stupid." [One example is] the type of response she has to a question or comment that might be really wrong. She'll say something like, "Well, that's a good point," but redirect the question to try to get the student to realize what the right answer is, just a gentle nudge to [help] them. She's just good at being real patient and real positive and trying to make sure everybody is getting the material. I've been trying to pick up on ways to do that and ways to ask questions of students to try to communicate with the students to make sure that everybody understands what's going on. She just seems to try to use different concepts and ways to make sure they get the material, that they understand the material.

In addition to Patti's ideas about the caring environment where all students are encouraged to be involved, she also discussed other aspects of Melanie's teaching as influential to her view of what science teaching involved. In particular, Patti highlighted the necessity of being adequately prepared and the importance of presenting science content in a manner that made it understandable to students. Patti repeatedly discussed the importance of preparedness as an important lesson that she learned from working with Melanie.

Patti: You have to be real well-prepared, have good materials, and try to make it interesting when you can. For everything you do you really need to be focused and have

good plans, and think of things you probably normally wouldn't think about. It's the details and it's establishing procedures and making effective use of your time and their time. And to me it seems like [it takes] a lot of planning. [You have to] make sure everything's organized and ready and you have to be flexible.

I have to make sure that I figure out the most efficient, effective way to do everything so that the end result is a good lesson in which [the students] participate, [and] they have learned the objective. It's knowing when to use what technique and what's appropriate, and what's the best, most effective way to handle the whole lesson and all its little component parts.

Everyone's different and has their own style, but I really can see the necessity for all the pre-planning [and] all the research. [I see that it is important to] make sure you have everything and that you don't just try to wing it. [I see] Melanie and how her classes run so well and everything usually works really smoothly because she puts this time and effort into it. I don't want to have to salvage things. I don't want to have to fly-by-the-seat of [my] pants.

Patti also felt that Melanie had the ability to take science concepts that might be difficult for students and organize them in a form that was easier for students to understand.

Patti: [Melanie] said [that] as a beginning teacher it would be really difficult to take that book and go into the book and really get what's needed and explain it in a way that [students] are going to understand it. [The teacher must] take difficult concepts and organize them, clarify them, and explain them so that big, huge, horrible concepts are either put into a different context or [put] on a simpler level. She does explain things in a way that they can actually understand. The book does not correlate with the level [the

students] are at. [Melanie] has to go through the book, read the book, look at the PBBs (county curriculum guidelines), look at the big picture and then make sure that they get the material they need in a way that they can understand it. She makes it seem easy. She makes it seem like, "Hey, I can do this." With the chemistry, she breaks down the problems step-by step so that it seems easy. [Melanie] just makes it seem accessible.

Opportunity for reflection prior to teaching lessons. An important aspect of Patti's relationship with Melanie was that it provided Patti with the opportunity to have someone to discuss her plans with prior to implementing them with students. Before Patti taught lessons in Melanie's class the two reviewed Patti's plans. At the conclusion of her internship, Patti again mentioned the importance of having someone with whom to share ideas about teaching.

Patti: Hopefully all of this preparation and having someone like a sounding board [is helpful]. You might be almost there, but you just need a nudge, [someone to ask], "Is there another way to do this?" I think I'll be ready to be on my own. I know it's not going to be perfect, but I think I'll be ready. It just [takes] practice and experience and figuring out what works, what doesn't work, how can I make this better. How can I look for everything-the nonverbal cues, the verbal clues? How can I look at everything and make it better, [and] make sure that they do understand?

Feelings of Progress. Throughout the internship, Patti discussed the progress she felt that she had made during the year. Patti felt she experienced overall growth as a teacher, but was particularly pleased with her progress in the area of classroom management.

Patti: I think I've progressed a lot, I really do. I know there's so much to work on, but I think of [myself now compared] to my first lesson. Everyday there's something else to experience. That's why I'm here to get experience. If I knew how to teach, I wouldn't be

here. I think I've improved a lot since I first started. [Today] I was actually able to facilitate discussions and have them interact and ask questions. And they do ask questions. I've been trying to link back to previous information and engage them, and ask questions that are not so directive and leading.

In one interview, Patti discussed the fact that she felt that conversations with Melanie and her university supervisor were helping her progress.

Every time I meet with them, I usually pick up two or three more [ideas for] fine-tuning things and helping me progress in areas that I need to develop in. I always get some good constructive feedback and techniques from every meeting. There's always something that we're working towards. They do say when [I] do things well and area's I need to work on. They're always real helpful with actual techniques of how to make this work. Every time I teach, it seems like I've learned new techniques or ways to handle things-ways to become more efficient with handing out materials, student assessment, questioning techniques, classroom management techniques, [and] using one overhead instead of four.

Classroom management was one area where Patti felt that she had improved during the internship.

Patti: They're behaving a lot better. I think I have a lot better classroom management with them. I'm more direct with them and if somebody's doing something that's wrong, I'll tell them. Like everything, there's always room for improvement, but I think that I've made a lot of progress with them. I think back on how I used to not talk real loud, but here I am we're actually having an interactive discussion. They're interested enough to answer questions but they're not discipline problems.

In another interview, Patti again mentioned techniques she had learned for classroom management.

Patti: Once you can start thinking about what makes classroom management successful, it's the details. It's the procedures, it's making sure you have a plan and you know what you're doing. It's part of classroom management that you have good procedures in place and stick to them. The average person on the street would not be thinking these things about teaching. I would have never thought about procedures for efficient handing out of tests, and pennies, and colored pencils. But I'm not making fun of it, it's important. I did not know how to efficiently and effectively hand out lab materials and get them back, and I found that out. You really have to think these things through and how you're going to do them and it's part of classroom management. You have to sit there and think- how am I going to distribute the materials? How am I going to get them back in an orderly way without taking too much time? It's important.

Patti's experience in Melanie's classroom helped her develop a new view of science teaching that included a more interactive, nurturing environment. Because of her experience, Patti began to realize the importance of being prepared and teaching for student understanding. Patti's conversations with and observations of Melanie helped mold this revised view of science teaching. Patti benefited from the opportunity for reflection provided by her relationship with Melanie. As a result of her internship experience Patti felt she made great strides in her abilities as a science teacher.

Melanie's Perspective

Melanie had a very different view than Patti about what had been gained as a result of their relationship. From Melanie's perspective, Patti had not made as many gains as Patti

thought. Melanie remained concerned about Patti's ability to teach on her own. Melanie summarized her thoughts about Patti's progress in the final interview of the project, and even through the final interview of the second semester, Melanie continued to be concerned about Patti's lack of independence. She felt that Patti relied too heavily on Melanie's old resources and ideas at the expense of developing her own style.

Melanie: As far as the responsibility that I wish she would take on her own, I don't think that has ever happened and it won't. I'm just helping her do the best she can and that's fine with me. I just can't make her be something she's not. She leans on me a lot for how [to do things]. I still feel like I'm telling her exactly what to do and how to do it every single day. Several times over the past six weeks I [have] talked to her [about this]. [I have said], "That's your decision. It's up to you now. You're in charge." But she's just not confident and she can't [seem to] make a decision on her own. She's not bad at wanting to bring in stuff on her own. She's understanding that there's a lot more she could probably do to be better, but as far as that take charge kind of planning, I don't feel like she bears any weight of responsibility.

I'm trying not to expect perfection out of [Patti], but I just want to know that I [would] feel okay if she was teaching my kid next year on her own. As long as I'm here, she'll be okay-that's how I feel. I just have no idea how it would be [if she were on her own]. I don't think I've really changed [Patti] that much. I think I've helped her some. I've helped her some to see that I don't think kids learn like that anymore, but I don't think that it's really sunk in.

Melanie shared her frustration that she did not feel that she had gained from the mentoring relationship because of the discrepancy between her view of science teaching and Patti's.

Melanie: To me being a mentor means I get to pick up stuff from [the protégé], and I haven't gotten anything out of this because I guess we're just clashing on our philosophies and what science teaching is. We're just at two different ends of the spectrum. I wanted to grow too as a mentor and to do that I need somebody [with a philosophy that's more like mine]. I don't care if they haven't taught before, I love seeing stuff through their eyes, and you can't have a two way relationship if you don't believe the same things. I have this feeling that when she's on her own next year, she'll revert back to what makes sense to her. I think that's the source of all contention and it stems directly back to the different philosophies of science teaching.

While Patti felt she had made strides in her professional development as a science teacher, Melanie remained concerned. She felt Patti made small gains as a result of the internship, but did not feel Patti was capable of self-sufficiency in her own classroom.

Tensions

Melanie's Tensions

In her initial interview prior to meeting Patti, Melanie stressed the importance of teachers using a variety of methods in order to reach all types of learners in their classes. She emphasized her commitment to the teaching profession. In Melanie's view being a mentor for a new teacher was part of her responsibility as a professional educator. In addition, Melanie focused on her expectations for a professional attitude and commitment to the job on the part of her protégé. As Melanie described her own role as a mentor, she stressed her belief that her role was to help her

protégé “become completely competent on their own.” In her view, the role of the protégé was to adopt a viewpoint that caused her to ask, “How do I get the student to learn as much as possible” while displaying enthusiasm and developing her own style. Melanie also described her concerns about the role of a mentor from the perspective of her experience with a student teacher in the past. All of these expectations of Melanie’s color her experience relating to her work with Patti as they influence what she believes to be her role and Patti’s role in the relationship. These expectations and beliefs affect the tasks that Melanie expects Patti to complete and the types of advice and reflective feedback that she provides. The disconnect between Melanie’s expectations and the reality of her relationship with Patti account for many of the tensions that arise within the relationship.

Patti’s schedule. During the first semester of the school year, Melanie and Patti agreed to a schedule that required Patti to be present in Melanie’s classroom for the entire day on Monday, Wednesday and Friday of each week. This schedule was problematic for Melanie because of the lack of continuity, and the two agreed to change the schedule for second semester. In the new arrangement, Patti was present for the entire day on Monday, Tuesday, Wednesday, and Thursday of each week. Melanie discussed the problems with the original schedule in the following narrative.

Melanie: I know that I don’t like the every other day thing, but right now, we can’t help that. Sometimes balancing teaching a lesson here and teaching a lesson there, it’s just conflicting. By the time I can plan ahead for her to be ready to do something, it’ll be on a Tuesday and she’s not here. And then if I move it back to Wednesday, she might be planning on doing something else with another class. It seems like we are always running into a problem. And I’m not complaining, I mean it’s fine. I’ve learned how to work it

out. I'm just thinking of her best interests. I just don't know how she is going to handle next semester with everything, but it will be a building process.

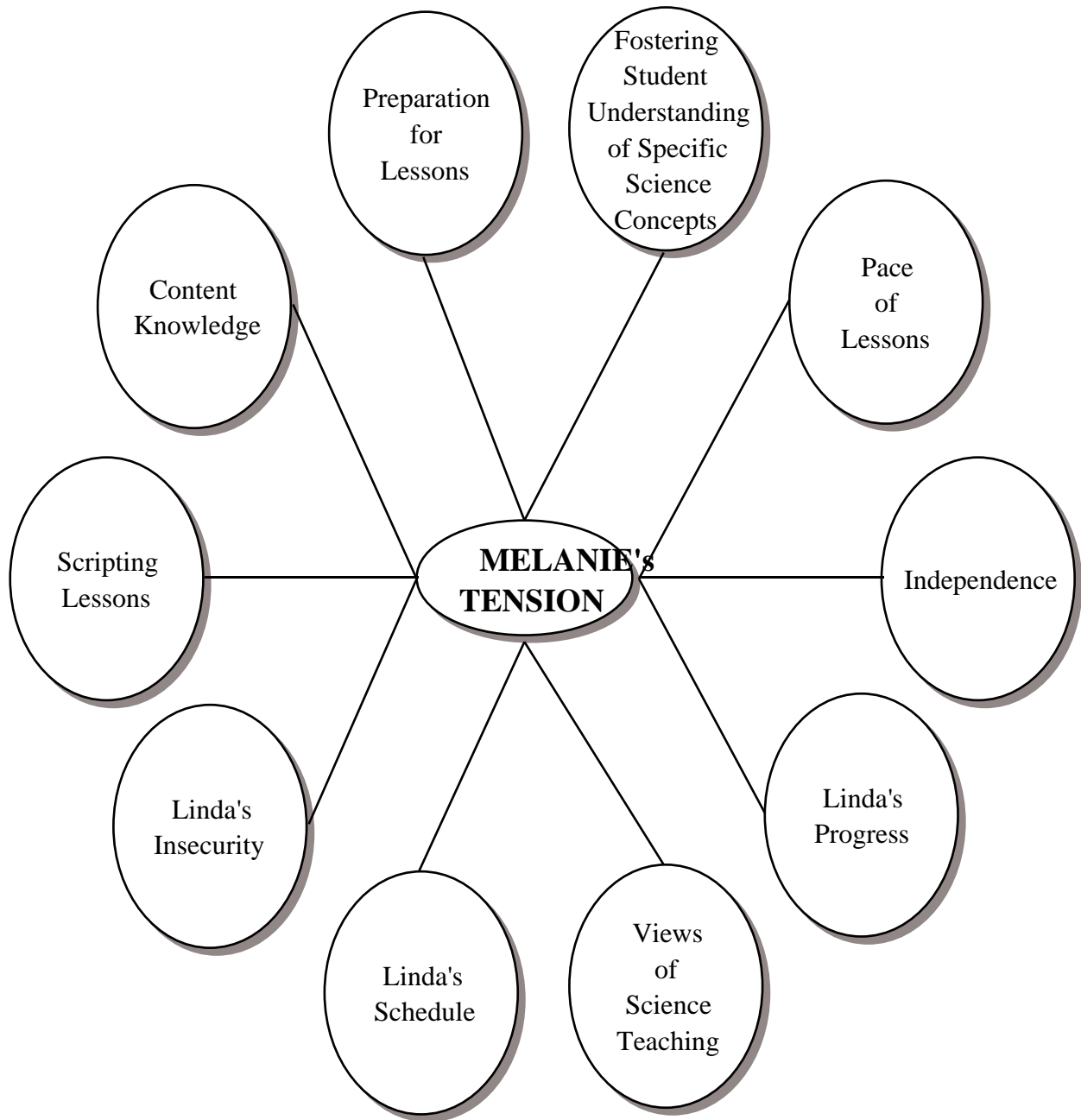


Figure 2. Overview of Melanie's Tensions

During an interview in December, Melanie discussed her thoughts about the upcoming second semester where the pair would follow the new schedule.

Melanie: This is like a Catch-22. It would be better if she was here. I'm just waiting sort of impatiently for next semester. In a way, I'm dreading it because I feel like we have a lot to accomplish next semester because of how slow everything went this semester. But in a way, I'm looking forward to her being forced to deal with issues day after day after day on how she's doing. The way it stands right now, a lot of kids are like, "Oh Ms. Braxton's (Melanie) teaching tomorrow." I know they are.

While she looked forward to the change in schedule, the time commitment involved with being a mentor to Patti was another concern for Melanie. The two spent their planning time during the school day and many hours after school to answer Patti's questions, review and modify her lesson plans, and reflect on the lessons Patti taught. As she described the change in schedule from first semester to second semester, Melanie related the following story.

Melanie: I'm so used to the every other day thing; this is so much better that I can't even complain about [Patti] not being here on Fridays. And, in a way I don't mind, because Friday is a day that I want to go home. And I always found last semester, that I liked for her to be here and I liked the job that we were-I was trying to do with her and everything, but I enjoyed the days when she wasn't here just because I was able to do my job.

For Melanie, the discontinuity posed by Patti's Monday, Wednesday, Friday schedule was problematic. The arrangement made it difficult to schedule teaching opportunities for Patti. Melanie felt this lack of opportunity for Patti to assume responsibility slowed her progress. However, Melanie was somewhat concerned about the amount of time required to adequately fulfill her obligations as a mentor.

Patti's insecurity. Though Melanie anticipated Patti's internship with enthusiasm and optimism, she quickly developed concerns about Patti's abilities in several areas. One of the first Melanie noticed was Patti's hesitancy in her interactions with students. The fact that Patti was very timid and hesitant in her interactions with students and in her willingness to take on greater responsibility for the classes was an area of worry for Melanie.

Melanie: In the beginning [Patti] seemed really, really hesitant about wanting to do anything, [and] stressed out about what the tasks were for a teacher. She just didn't seem [to be] one of those kinds of people that she could just walk in and I could say, "Why don't you just watch me and then why don't you [conduct the class]." I think [she has] a lack of confidence working with the kids, or doing something different that she hasn't done before. I feel like there must be [some] insecurity issues about being afraid to jump in there and help take over things. I think she's real timid when she's with the kid, that's something we are going to have to work on.

As the semester progressed and Melanie did not see a change in Patti's confidence level, she became frustrated with Patti's insecurities.

Melanie: I'm just one of those kinds of people that I can understand your self-consciousness and your insecurities for awhile, but we're to the point now that I can't deal with your insecurities that much. I'm just tired of hearing that you're scared; I'm tired of hearing that. Sometimes I feel like I'm working with a scared little animal. You have a lot of compassion for little animals that are scared. I feel sort of protective like that, like good grief, I won't ask her to sit down and help with the Chemistry because she's freaked out. I am friendly and it has to be positive, there's no way it will work if we don't have a positive relationship, but it won't remain positive if we keep the scared and

the whining and all that up. It's like, if you have that many questions, I'm wondering if you're kind of over your head and maybe you should be doing something else. But I want to help you be a teacher if I can, and be a good one.

One of the areas that this lack of confidence was problematic for Melanie was in Patti's inability to facilitate class discussions. Melanie felt that Patti often relied on lecture rather than class discussion because of her own insecurities.

Melanie: That's just a confidence thing to me. You're not going to [lead discussions] unless you feel really comfortable with the fact that you could answer [questions], and not just have this rehearsed thing da da da da da and then just do it. But being able to facilitate a discussion with them was a big deal to me.

Scripting lessons. Another tension for Melanie in watching Patti teach was that Patti sometimes attempted to script word-for-word exactly what she would say.

Melanie: It was frustrating because she would just take these religious notes almost word-for-word of things I would say in class and try to repeat everything exactly.

Melanie related what happened one day when she made suggestions for changes that Patti could make after Melanie observed Patti's teaching during first period.

Melanie: Today she did first period and it didn't really go very well. I made a lot of suggestions for fifth. I did it between classes, but it was like why don't you try this, this, and this. She did make my suggested changes, but instead of being involved with the Chemistry classes, she was absorbed in [making those changes] for three hours straight. She even wrote out a script of how she would say things. First period she really glossed over the helicases. I [said], "They have no idea what a helicase is." She had scripted out two front and back pages of what she would say and wanted me to read it. I kind of

glanced over it in the 5 minutes I have between classes. I said, "It sounds fine, but you can't get stuck trying to memorize what you're going to say." When I see her prepare, she really is working very hard. It's just not stuff that I would think you would need to work hard at. I don't want to criticize somebody for having to script out what they're going to say and being a basket case if they can't script it out. She obviously needs to do that.

Melanie indicated that by the end of the internship, Patti no longer felt the need to script her lessons.

Content knowledge. Another area of concern for Melanie related to Patti's teaching abilities centered on Patti's lack of content knowledge in some science areas. Though Patti had experience in several health-related fields and planned to get a job teaching biology, half of the courses that Melanie taught were chemistry courses. An additional dilemma was the 15 years that had passed since Patti had taken content courses. Melanie discussed her concerns in the following narrative.

Melanie: The content is apparently a very big issue. It's a new relation for me because when I started teaching I was right out of college so I could just stand up there and say, "Well you know." It [took] some refresh[ing] for me, but it wasn't that big of a struggle. It seems like it's a big struggle [for her] to relearn a lot of stuff. She's printing miles of paper off my computer, off the Internet. I guess if you haven't been in school since whenever it was for her, then that would be very frightening. That's just not the most important thing to me. I wouldn't want her to teach stuff wrong, but if your bare minimal understanding at the time was what was in their textbook, then it's what's in their textbook. I guess she's feeling like she's pulling double duty right now with learning it

and [teaching it]. And it really seems right now that she is not as concerned with the pedagogy of it, how to get them hooked in [so] they want to learn it, but she's very concerned with learning it herself right now.

While Patti struggled somewhat with issues of content in biology, her difficulties with chemistry content were greater. Throughout the first semester and into the second, Patti's knowledge of chemistry was a concern for both Melanie and Patti.

Melanie: The only chemistry class she has ever taken is in high school and she made a C. She told me that. And she [was] happy to get a C. It's a real struggle for her. She just flat out doesn't know it at all. I mean she honestly is learning it for the first time. That's really hard on a mentor teacher. It's one thing to help you design the best lesson; it's another thing to worry about the content to start with.

Because of the difficulties Patti experienced in her internship, during the second semester Patti's university supervisor along with input from other university personnel decided that Patti would not take over primary responsibility for Melanie's chemistry classes. Gradually over the course of the second semester, Patti taught all of Melanie's biology classes; however, she assisted Melanie with the chemistry classes and observed other teachers during those periods. Melanie's response to this decision is highlighted in the following passage.

Melanie: [When we told her about the decision], she was like "Thank God." I mean you could just see it. And I thought wow. She was really, really happy about it. In fact, I'm not real sure to be honest with you how I felt at first. Part of me [thought], that's a crock. That totally is. How can you pass when you're not-but I had other teachers here tell me that they had had that happen to them before? I told Dr. Baldwin when we were sitting in there-I said, "I just didn't expect [to have to teach her the chemistry content], and I

don't think I should have to teach her so that she can just repeat it to them." Teaching to me is-you get it so well that you can explain it this way and then when that doesn't work, you try it this way and you think of this creative thing to do with them and that's teaching. If all I'm doing is teaching her the content so that she can turn around- we're not going to get anywhere with that. So, I'm happy with that.

Preparation for lessons. Another area where Melanie became concerned was in Patti's preparation for teaching the classes. Melanie felt that she could be of more assistance to Patti if Patti was able to prepare her lesson plans farther in advance. Melanie was frustrated that often Patti's planning was often last minute.

Melanie: As much as I want to get her to stop doing this, she's really kind of a last minute person. She was calling me last night to ask if we could get a projector; she had found some web-site she wanted to show them. She's not planning ahead as much as I thought she would be. She went home over Christmas knowing what she was going to be doing. It seems like if I had been told over Christmas break that I would be responsible for Chapter 15 that I would have [come back] with some really specific ideas.

As Melanie described her response to one of Patti's lessons she related the following thoughts related to Patti's preparation.

Melanie: At the bottom of the paper for first period, I said, I know this sounds negative Patti, but almost all of this could have been avoided if I could have seen everything.

There's no way I would have let her go in there with most of that stuff. There's no way.

By the end of the internship, Melanie shared that the situation had improved somewhat, but Patti's planning was not as detailed as Melanie felt it should be.

Melanie: *She has been showing me everything two or three days ahead of time. But when she shows it to me, that's when I say, "This would be a good way to do this." She'll just have all [the notes from the book] on her legal pad, just all that stuff. She won't have an idea of how to do it, or how to present it or get [the students] into it. I'll say, "This is how I would probably do it, or this might be a good way to do it." And she'll say, "Okay."*

Managing the learning environment. Melanie also felt that Patti struggled with issues of classroom management. Melanie discussed the fact that she felt that Patti could not pick up on the verbal and non-verbal clues that students gave her.

Melanie: *She comes up to me and she [says], "That wasn't very good was it (imitating a whiny voice)." That's something that she'll typically say, "I didn't do a very good job did I?" So in a way I think she might know that it wasn't great, but I think that if she didn't have somebody- let's say she was just on a provisional certificate and got stuck in a classroom and didn't have any feedback, I'm not sure that any changes would be made. I can tell when I struggle with the Chemistry lesson being the first time I taught it, just by watching the kids faces. I can tell if I'm struggling. I can tell if I did a bad job because they start getting antsy. They'll look for something else to do. You'll hear the sighs. They don't get it, I'm just not explaining it in a way that it's meeting their needs. And I know that she hasn't clued on to stuff like that yet. The little tiny things that you can pick up on, looks on the face, little sighs, little things like that that you hear and you'll go okay, this must be really boring. I know she hasn't picked up on that at all.*

Melanie felt that Patti had other problems associated with developing a positive learning environment. While Melanie related several incidents highlighting Patti's struggles, the following excerpt is typical of the incidents Melanie described.

Melanie: I wondered if my presence in the room made them give her a hard time. So I left and I thought maybe when it's just her and them [it would be better]. [I went back into the lab room] and listened to everything and they were awful. They were worse. I just stayed [in the lab room] and [Patti] came back in here. The bell had rung, they [were] all gone. She came back in here and I said, "Well, how do you feel like it went." She said, "Some things were good, some things were bad." And I said, "Well, what do you think was good?" She said, "Well they were asking questions and they seemed like they were paying attention." I said, "Well, what was bad?" She said, "Well, I told Paula that if she didn't sit up I was going to give her detention. I held her after class and I tried to give her a detention and she just started crying." I said, "Well, I was listening to the whole thing and in Paula's defense, it's hard for me to believe that you would hold her after class for a discipline reason and you didn't say anything to Greg and Andy, because I couldn't hear what you were saying half the period they were so [disruptive]. They were just too overbearing in class." I said, "I can't believe that you would hold her after class for putting her head down. She is a pretty slow learner, and maybe she was getting frustrated and that's why she put her head down, because she was having a hard time hearing you too."

Pace of lessons. In Melanie's view, students were often bored when Patti was teaching. One aspect of Patti's teaching that contributed to students' boredom was the pace of Patti's lessons.

Melanie: *Everything's just kind of in slow motion right now. That's my biggest complaint and I haven't voiced that yet. I want to wait and see how she handles taking roll and getting the kids in order. Everything is just really in slow motion. It slaps me in the face.*

In a later interview, Melanie commented that Patti's pace continued to be a problem. She questioned whether Patti's pace in class could be a defensive mechanism.

Melanie: *The pace is still very slow. Just over these past couple of weeks, I've seen her get some techniques for handling the kids that have been much more efficient. I thought I saw a little bit of improvement today when she was teaching, and then sixth period it sort of went backwards. Sixth period was still making DNA [like the other classes] and replicating it, it just took longer to get there. They didn't have a lot of time to do it because she just kept talking. I'm starting to wonder if that's sort of a defensive mechanism. I was a little frustrated-[she would] uncover this big [transparency] and then she talked the whole time. To me that's a defensive mechanism, like, "Don't ask me any questions. Keep yourself busy." And they were. So I'm wondering if some of these pacing issues are maybe going to get better once she gets comfortable with the kids and develops a rapport with them and is used to having people observe her so she doesn't have to be on the defensive.*

Independence. Over the course of the year Melanie became concerned because she felt that Patti relied too heavily on imitating Melanie's lessons rather than developing her own style. Melanie was also frustrated by Patti's lack of motivation to take over more responsibilities of her own accord. Melanie and Patti started the second semester with Patti primarily responsible for one biology class, while Melanie retained responsibility for the other two. During the semester,

Patti gradually became responsible for all three biology classes. Melanie described the experience in the following narrative.

Melanie: She was trying to model [me] in a way, which is okay at first. But I was throwing her into it in a way because I didn't feel like last semester the approach of saying, "Oh, come on I want you to jump in there" worked. I think she's sitting there waiting for me to tell her what to do, so I just started doing it. [She seems] really hesitant to make any kind of move on her own. I want her to be self-sufficient [and] independent when she leaves.

I don't like to suggest too much or say that you have to do it [a certain] way because I know that she'll do something that I suggest and then she'll just stick to it and do it every time. Then when that doesn't work in a certain situation, she'll say, "Well I was just trying to [do what you said]." I would really like for her to be able to make judgments on her own in the [students'] best interest.

This lack of self-sufficiency was also a concern as Melanie and Patti had reflective conversations about Patti's planning and teaching. In the following narrative, Melanie related what happened in a typical conversation between the two.

Melanie: I [asked her] how she would change. She was like "I don't know." I waited and then I [said], "Well I tell you what I would do." I hate to keep doing that because I really want to facilitate her thinking on her own. But it seems like I talk myself through things and by the end of the time I [end up] saying, "Well you know, you could do that tomorrow." And I just come up with something, and then I've already told her and she's already got it planned out for tomorrow. It always ends up like that. I try not to talk too much; I just keep waiting on her to jump in, but it doesn't usually happen.

I don't know when to cut her off and say, "I'll tell you where anything is. I'll help you get any materials, but the rest of it is completely up to you." She always says, "What do you think I should do?" I don't know at what point I should say, "I'm not going to tell you what I think anymore." In a way, that's not what I'm here for, I'm not here to just throw her out there. It makes me feel like in a tiresome kind of way, I have to tell [her] everything.

Patti's progress. Melanie spent many hours every week trying to help Patti improve her teaching. The two spent time during planning and after school reflecting on the lessons that Patti taught and preparing for upcoming classes. However, Melanie became frustrated because she felt that all of the time she was committing to the relationship did not translate into growth on Patti's part.

Melanie: I really have to go home and try to refresh and [think] tomorrow's another day. Personally after working with her for this long, I don't think anything's going to change with the way she conducts class. If I had to guess, I would think that the way she conducts class would probably be the best it's going to get. I get frustrated at doing the same things over and over again. I just feel like she should know all the kids names by now and that she shouldn't be marking people absent that aren't absent.

It's hard to work with her because it's just taking a long time and there are days when you feel like things go backwards. She has made some adjustments-the easy trivial things, like I say, "[Speak] a little louder, move around, [use a] little voice inflection." But that light, that spark, that I love what I'm doing and I want you all eating off my fingers-that's not there at all. I don't know that she's anywhere close to that quite

frankly. I'm sitting here thinking, does she understand that at least that's where she would want to be.

I've actually been thinking about this this week- when do you not pass somebody? When do you say they're just not competent to carry on this job? I mean I have to put that behind me and say, nobody should have to fail, but I just don't know at what point to say you just didn't progress. Even though you tried, you just didn't progress to where I feel like you should be. I feel like I should give her a head's up if I'm having these thoughts. I feel like I should tell her. Now when do I tell her and what do I say? I'll think of something tactful to say, but when do I tell her and what reasons do I give? Do I say, you're just not very interesting? I don't know.

Views of science teaching. As Melanie reflected on her experience with Patti she came to the conclusion that for her the greatest source of tension in the relationship was that she and Patti had disparate views of what science teaching should be. For Melanie, student involvement was an important part of the culture of her classroom. She used a variety of teaching strategies including lecture, group work, labs, and projects. In each case, she found ways to have students actively involved in the activity. Melanie felt that despite numerous discussions the two had that addressed this topic, Patti did not design and implement lessons that allowed for high levels of student involvement.

Melanie: One of the things that I have continued to try to get her to do is to keep their minds going the whole time, not just copying something, or not just being told something, but letting them try to do as much as they can on their own. [In many of her lessons], she was talking a lot and the lessons were very teacher centered. They weren't focused on ensuring that the students were actually understanding and giving them practice.

When asked in the final interview to articulate her view of science teaching, Melanie shared the following thoughts.

Melanie: I think that we really differ in the way that we view science teaching and that her last memory of public school was probably very driven by [the idea that] you sit in your desk, and don't say a word, and then you have a test. I just don't think kids learn like that anymore or they've been exposed to so many [other things] that they don't want to learn like that. They'll do better in another situation. My view is that [students] play a greater role. I do not believe they can play the entire role of discovering and all I am here for is to help them facilitate their learning. I see myself as a very strong guide. They're not sitting passively in their desks. [I try to] put myself in their place and try to understand what it must be like in this day and age with this many classes, and all of the classes stepped up.

Melanie's impressions of her mentoring. Patti was only the second student teacher that Melanie had hosted in her classroom. Though she felt her mentoring approach was appropriate, she was somewhat uncertain. As time passed and Patti did not improve, Melanie began to despair because she did not know what other strategies to employ.

Melanie: I would not mind any help, this is only the second student teacher I've had and I guess I've never had one on a long term basis, and I've never had one balancing other things in their life too. Last year I had a college kid that just lived and breathed this because they knew they were supposed to. I think what I'm doing is fine, appropriate, I just don't know what else to do. I wish I had more experience.

I mean it's pretty sad when I pray every day, "God please just help her and tell me what to do. Tell me how to be more positive to her." Because I know with people like

that, it doesn't take much to get them into a rut and then they feel beaten all the time, and I'm not that kind of person. I feel like I am a terrible mentor because there is nothing I can say that's more positive. I can't lie to you. I'll praise you for what you're doing, but I just can't keep being positive and faking it. I [don't] know if I'm just being too hard on her, or misjudging some things, or if this was normal.

Summary. Melanie was concerned about the timidity and insecurity that she noticed in Patti. Melanie believed these characteristics interfered with Patti's ability to be an effective science teacher. When Melanie did not see improvement in this area, her frustrations increased to the point that she considered suggesting that Patti should fail the internship. The lack of confidence was not the only factor influencing Melanie's thoughts about Patti's abilities. Melanie lamented that she felt Patti was unable to facilitate student involvement in lessons and that Patti was too reliant on Melanie and did not develop her own unique teaching style. Patti's continual struggle with the science content was an added area of concern. Melanie felt that Patti continued to plan lessons at the last minute, leaving little time for Melanie to offer advice and assistance. Given the difficulties Melanie perceived Patti to have, this was a problem. During the entire internship, Melanie felt that Patti had difficulties with classroom management and gauging the pace of her lessons. One of Melanie's goals for Patti at the outset of the internship was that she become independent and able to carry out all of the duties of a science teacher without constant input from Melanie. In Melanie's view she was never able to wean Patti from heavy reliance on Melanie's guidance. Given this group of circumstances, Melanie questioned whether Patti would be able to be successful on her own.

Patti's Tensions

As Patti transitioned from her previous career into teaching, she faced several challenges that were sources of tension for her. One problematic area was the disconnect between her expectations for schools and teaching and the realities she encountered. Though Patti had experience in a variety of work settings, she had little experience with secondary school other than her own experiences as a student. Even before her internship in Melanie's classes, she recognized that schools and teaching today are different than in her memories. Patti had to redefine her ideas about the roles and responsibilities of science teachers. The desire to appear competent about scientific content knowledge was a second area of concern. As Patti completed her internship, she expressed a strong desire to improve her practice and add to her knowledge about teaching. Patti struggled with her thoughts about the many areas where she wanted to develop as a teacher.

Roles and responsibilities of a science teacher. As Patti began her internship, her primary experience with schooling was as a student. Over the course of the year, she began to realize that science teaching as it is currently experienced by students is different than what she experienced as a student herself. This discrepancy between her expectations of teaching based on her own background and the reality she experienced in Melanie's classes was a source of tension. Patti also found that she had difficulty with classroom management issues. Her previous experiences had not prepared her for the realities of the possible behavior issues of high school students.

Patti: It's just so hard because no one ever did this when I was in high school and they certainly don't do it in college. I just finished that genetics class and she'd give examples and things, but it's not like we had time to sit and have an interactive discussion. This is just a new experience for me to try to really involve [students] and assess them daily, and

not-I'm going to [just] lecture-[and have students] take notes. You get it, or you don't. You take the test, that's your problem. And maybe I'm remembering it wrong, but it really seems like when I went to high school, that's the way it was. I'm sure we did some interactive things and problem-solving with math, and question and answer and discussion, but a lot of it seems like it was just lecture.

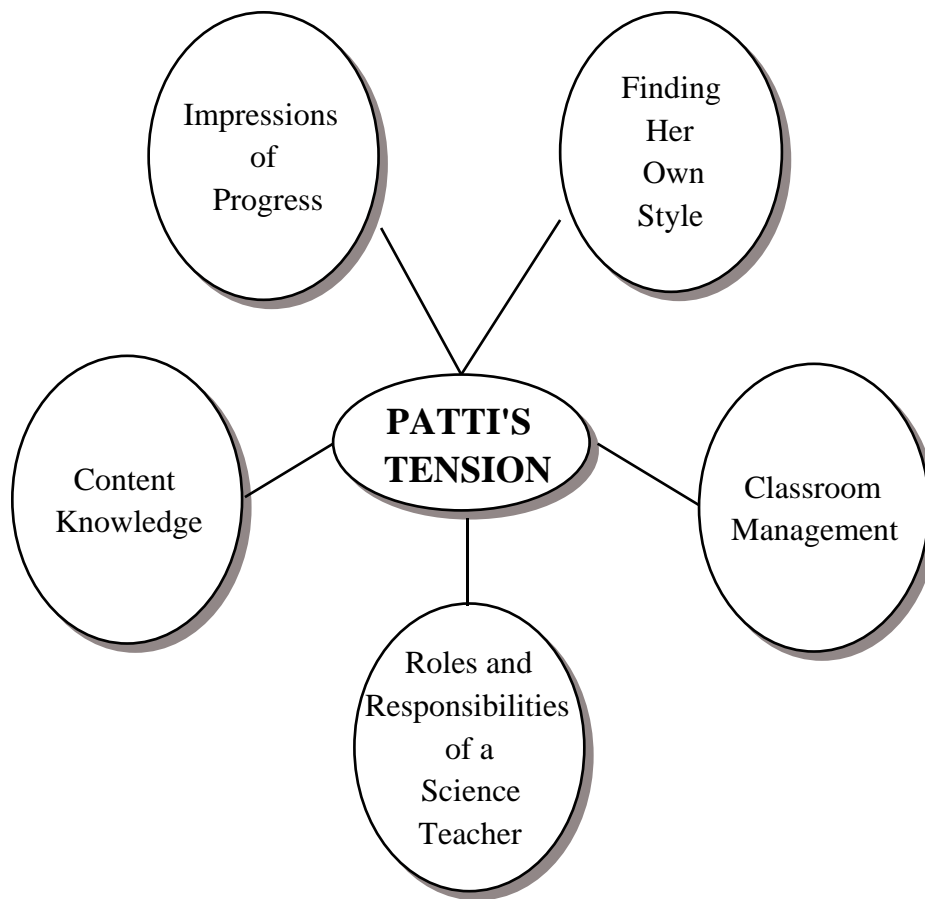


Figure 3: Overview of Patti's Tensions

With this realization that expectations for the teacher are different now than what she experienced as a student, Patti also expressed her feelings about the difficulty of teaching.

Patti: It's hard to look at things and try to make them interesting and try to involve them.

It just seems like the normal person that was not in education would think [that phrase

you] always hear, "People that can do, those who can't teach." Well, they should come try this. I think they should have more respect for what people actually do on a day-to-day basis. Especially at this school anyway, it seems like people do care if the students get it or they don't. It's not like-I'm just here to [teach] and if they get it, they get it.

Content knowledge. Patti's background in science was in fields related to biology including respiratory therapy and pharmaceutical sales. Though she had developed biology expertise in these areas, many years had passed since her college content courses. Patti had little chemistry background. The fact that Melanie's teaching assignment involved teaching three periods of biology and three periods of chemistry created a tension for Patti.

Patti: I'll be honest with you, at first I was a little disappointed that half of her classes are chemistry and the other half are biology because I was expecting someone that had all biology. I don't want to teach chemistry. What we're doing right now, I still have to go back and learn material from last semester and learn it enough to have a foundation to explain it. I don't mean to be negative, but it's going to be a lot to do. I just have this fear of getting up there and people asking me all these things that I don't know in chemistry. It's difficult. I was thinking the other day, wouldn't it have been so easy if I had been in somebody's class that taught anatomy and physiology. Wouldn't that have been wonderful? I could have been an asset. I could have known something.

While Patti was more confident in her knowledge of biology than of chemistry, she still had tensions relating to ensuring that she knew the material well enough to appear competent to the students.

Patti: If you start off not knowing things, then they get the impression that [you] don't know anything. I don't want them to feel that way. My big thing, and I told Melanie this,

I said, "I do not want to look stupid." I want to know the answers to things and I don't want to get up there and look stupid.

In order to feel prepared to answer student questions about topics discussed in class, Patti spent many hours reading and researching each topic. In the following passage, she described an instance where she prepared in this way.

Patti: I [went] to the library and checked out books on moths and butterflies. I wanted to be prepared. Off-hand I didn't know the difference between a butterfly and a moth and surely somebody was going to ask me that, so I wanted to be prepared. I [thought], "Gee, that hour of reading paid off." Even stupid things, like most people probably know the difference between a butterfly and a moth. I don't, but I do now. I just have to work extra hard at stuff like that. I just have to work at it.

Impressions of progress. Patti had a strong desire to leave Melanie's classes as a capable and competent science teacher. She did feel that she made progress towards this goal during the internship. There were some particular areas where Patti felt she struggled in her progress due to the difficulty of the job of teaching.

Patti: I'm still in the very beginning, inexperienced stage, but I think I've made a lot of progress from where I started. With the Punnett Square lesson, it was awful and I just felt bad. I felt like they didn't really get it and I had put so much thought and time and effort into it. It's just hard. You don't want to overdo it and go over things so that they're bored.

One tension for Patti relating to her performance was the disconnection between where she wanted to be in her expertise as a teacher and where she felt she was in the progression.

Discussing a difficult conference between Melanie, Patti, and Patti's university supervisor, Patti explained her feelings in response to the conference.

Patti: It was a very emotional day. I know I was disappointed that I [hadn't] made [more] progress. I guess a lot of people in their internships get to a point where they want to be here (holds hand up high). You've come from here to here (moves hand to indicate some progress), but you're not here (puts hand at high level again). And it's frustrating. I was upset with myself and I cried. Not like boo hoo, but I was upset with myself. I just felt like I had come so far, but of course I have a ways to go. I just felt like, "What else could I do? I'm trying all these things, WHAT else can I do?"

Finding her own style. One tension for Patti related to her performance was her desire to find her own style as a teacher. Patti admired Melanie's teaching but felt that it important that she develop her own style, suited to her personality.

Patti: I'm having a problem with finding my own style that works. I've only really been exposed to Melanie and the way she does things. It just works so well for her. She sits there and she does chemistry problems with them [on an overhead transparency]. It just works for her. But it's not that great for me because it's real awkward for me being left-handed. She's got her method and it works wonderfully for her. I'm still trying to find [mine]. I don't think any one method is going to work. I don't want to copy her. I'm really trying to find my own stuff. I don't want her to think that I'm copying her or not trying to find stuff on my own.

A second area that caused tension for Patti as she worked to develop her own style was her perception regarding the difficulty involved with finding resources to use in her teaching.

Patti: I spend hours on-line looking at stuff. Maybe getting some more old books will help me see examples. It's kind of discouraging when you go on the PBB [web-site] and there's nothing there. You go there, and the [activities] are not practical. I guess if we had five days to go to a pond it would all be wonderful. We don't have [that] kind of time. I try to do what's in line with what's in their book and the PBBs, but it's hard to find different things than are in the book. You don't want [students] to look at it and [think], "Oh, she's just using what's in the book. She's not real creative." There seems to be a real lack of what we're looking for-not a full blown lab, just something to make it interesting, an activity to get them involved. There just seems to be a real lack of a short something you can do in 20 minutes or 10 minutes, something that's effective, to the point, clear and you could do it in class. That's the problem, trying to find things that work when you can look in so many places and there just doesn't seem to be that much out there. Hopefully, soon I'll be able to look at material and think of a good way-just look at it and [think], "Okay, I'll just do this or I'll do that, or I can do it this way." I guess the more you teach, the more things you think of, and then the more teachers you get to know, the more ideas you can get from one another.

As Patti struggled to find her own style of teaching and improve her own performance in the classroom, one of her concerns was that she ensured that she appropriately geared the level of science content to the age and ability level of students in the class.

Patti: It's just hard to put yourself in their shoes. It's hard to try to be at their level, not below their level, not above their level. It's really hard to communicate and to teach effectively. It's just finding that balance and doing all the other things correctly so that it all works. Basically [you have to] take the [information] and translate it into material

that makes sense to them on their level. It's harder than it seems, it really is. My last experience was in that [college level] genetics class, and if you are used to that style and that way-and then calling on doctors for years- you have to know things inside and out. You have to sound intelligent.

Classroom management. Patti experienced tension as she progressed in her ability to manage the classroom using techniques that would allow her to conduct class in the manner she desired. She wanted students to feel comfortable expressing their ideas and opinions, yet she wanted to maintain control of the class.

Patti: It's just hard to get them settled down. I don't want to stifle them, but I don't want them to run over me or act inappropriately. We're working on that.

Patti describes some of the management issues that she encountered over the course of the year.

Patti: I had people not paying attention and putting their heads down on their desks and I saw it. I guess I should have given them detention right then and there, but I didn't. That was something new they had started doing. We talked about doing detention for talking or blurting out answers. You get to a point where you want them to answer questions, and it's really hard because sometimes you want a group answer and sometimes you don't.

Referring to another incident, Patti shared the following experience.

Patti: Someone said something about weed [and] I just ignored it. I didn't say, "That's inappropriate, stop that." I just ignored it. I guess that's wrong. I've never been in situations where I really had to be that [forceful] to get people to do what I wanted them to do. I've never really had to do that. I'm just not that way. When I want people to do things for me or with me, I'm used to asking [or] negotiating. [For example, I might say],

“I need some help, or do you need some help.” You didn’t have to [say things like] “Sit down.” “That’s inappropriate.” “Be quiet.” I’ve gotten a lot louder now. I’ve just never had to do that.

Though Patti described her overall experience in the internship as positive, there were areas that were tensions for Patti. In particular, Patti struggled with changing her perceptions of what it meant to be a science teacher, with appearing competent in her knowledge of the science content, and continuing to make progress in all aspects of her teaching.

Summary. Throughout her internship, Patti experienced many tensions associated with unexpected aspects of her role as a science teacher. She struggled under the weight of the planning and necessary content knowledge as well as the surprises she faced as she learned about the change in schools since her own days as a student. Patti felt challenged as she worked to develop her own style as a teacher and learned to effectively manage a science learning environment.

Change in Relationship During Internship

The final question to be answered through this research project was how the relationship of the participants changed during their internship experience. Not surprisingly, the two members of the pair expressed differing views relating to this question.

Melanie’s Perspective

Patti began her internship in Melanie’s classroom in the middle of October and continued through May. From Melanie’s perspective, her relationship with Patti progressed through several stages over the course of the year. Early in the relationship, Melanie expressed feelings of optimism and excitement about her work with Patti. By the end of November, Melanie began to relate some concerns but was still hopeful that she would see improvements. As the end of

January approached, many of Melanie's concerns had become frustrations. During February Melanie developed a sense of resignation and acceptance of what she would be able to accomplish through her mentor role with Patti.

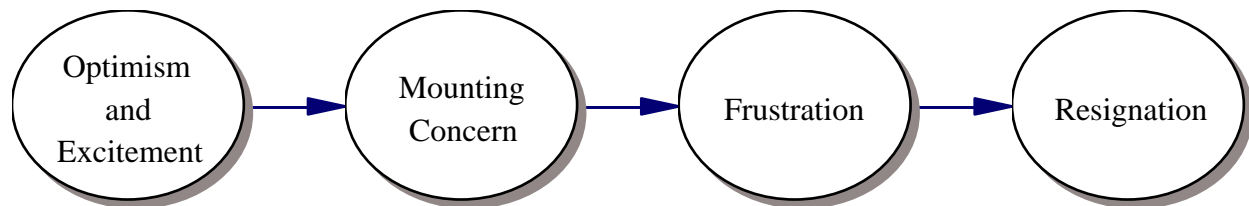


Figure 4. Melanie's perception of the change in the relationship over the course of the internship

Optimism and excitement. Initially Melanie was excited about her work with Patti. She appreciated Patti's level of maturity and the seriousness with which she approached the internship. Melanie thought that Patti was asking appropriate questions and preparing to take on greater responsibility. The following narrative contains excerpts from interviews in October and early November.

Melanie: I really like having her here. She's a really easy person to get along with. I like having somebody that's a little older [because] I don't deal with immaturity very well. I was real pleased with the kinds of questions she was asking me [after she graded an assignment]. [When she chose an activity for mitosis], I thought it was really neat that she found an activity [where she] kept the students in mind. I thought she was really thinking about them- what [activity] would they learn best with and what would they relate to best.

Mounting concerns. As time passed, Melanie began to express some concerns about Patti's background knowledge and progress. While Melanie developed some reservations, she was optimistic that with more time in the classroom Patti's confidence would increase and she

would accept more responsibility. Interviews beginning in the middle of November through the middle of December highlight Melanie's mounting concerns.

Melanie: I just realized we don't have much longer until Christmas break, and then when we come back, within a couple of weeks I would like for her to take a class and I don't want her to be thrown into it cold.

She tells me that she's learning Chemistry for the first time. I don't feel like she's ever going to [jump in] and teach the Chemistry. Probably she's one of those people that will [just wait to] do it when I ask her to. [But I want her to] understand that the Chemistry will be twice as much work as learning how to teach biology and I really wish she was picking up on the Chemistry as we go.

[After her mitosis lesson], at least I saw the potential for somebody that was going to be really different from the first person I met. I feel like there must be insecurity issues about being able to jump in there and help take over things. It seemed like after I praised her some, she got a little more excited about [her teaching]. She probably is lacking a lot of confidence. [I realized] I need to quit focusing on [teaching suggestions] and just give her some kind of confidence right now. Once she's got some confidence, then I can go back and say, "It might be a better idea if you [teach it this way]." Any mistakes she's making now with planning are just natural not having worked with kids before. I know that will come around.

I felt like we were starting to be friends. You can't just throw yourself into a situation and be somebody's friend automatically, but I was really hesitant in the beginning because I was having a hard time reading her. I think what I was reading was just fear, and I think the more she teaches, the better it will get.

While she was optimistic about the coming semester, Melanie began to be frustrated by some of the problems that she saw.

Melanie: I don't think she's perceptive enough to sense any kind of frustration or urgency about anything and in that respect [things] are fine. She has no idea when I'm frustrated. I want her to be successful, I really do. I'm one of those people that can deal with insecurities for a little while, but I'm tired of hearing that [she's] scared. It may come to a point next semester that I say, "You've just got to stop complaining about this, it's really bothering me." I am friendly and [our relationship] has to be positive. There's no way it will work if we don't have a positive relationship. I always keep it on the up and up, but it won't remain positive if we keep the scared and the whining up and to save the relationship, there may come a time in January where I say something.

Frustration. Between the first and second semesters, a major shift occurred in the relationship. During the first semester, Patti was present on Monday, Wednesday, and Friday. Melanie was not happy with this schedule and the two negotiated a new one for second semester. Patti came Monday through Thursday in the new schedule. By the middle of January, the word frustration appeared more frequently in Melanie's conversations. She wanted to help Patti improve as a teacher, but felt she had exhausted her ideas for strategies to facilitate Patti's development. Patti's dependence on Melanie and the fact that Melanie felt she has to address the same issues with Patti repeatedly led Melanie to question Patti's ability to be a science teacher. By the end of January Melanie began to ponder whether Patti should pass her internship, and shared her thoughts with Patti.

Melanie: [There is] not a lot of confidence there and I guess I am starting to get frustrated with so much fear. If you have that many questions, I'm wondering if you're

[in] over your head and maybe you should be doing something else. [She] seems really hesitant to make any kind of move on her own so I have gotten real frustrated. I feel like I give her really useful feedback, then the feedback goes in one ear and out the other. That's where I get frustrated. I get frustrated at doing the same things over and over. It's one thing to take somebody on [as a protégé] and stay here until 5 o'clock. It's another thing to feel like you have to tell them every last little thing to do.

It was during this time that Melanie questioned whether Patti really could become a teacher.

Melanie: I've been actually thinking this week, "When do you not pass somebody?" When do you say, "You're just not competent to carry on this job?" Maybe she's just so insecure that she needs to get over the hump and I don't want to make it harder. I hate that, I don't think anybody should fail student teaching. I probably will recommend that she pass unless things turn out horribly, but I don't want to keep being frustrated with her. And my frustration does come out. I know she can hear it in my tone of voice. But, I just don't know how to get [her teaching to be] any better. I don't know what else to do. It's gotten very frustrating. [Our relationship is at] this weird frustrating point right now.

Resignation. As the middle of February approached, Melanie looked to outside resources from the university for assistance. Melanie decided that Patti was not making the progress that Melanie wanted to see, but resigned herself to doing whatever she could to help Patti complete the internship. During this time the decision was made to have Patti focus only on the biology classes and not take over primary responsibility for any of the chemistry classes. By the final interview in April, Melanie did not feel like circumstances had changed much, however, she has vowed to help Patti make whatever progress was possible.

Melanie: I've kind of resigned myself now to the fact that depending on what [her university supervisor] says, I am going to [stick it out]. Even last week I was saying that maybe I should counsel her out [of teaching]. I don't feel like I should do that anymore. I do worry about what it will be like for her when she first starts out on her own.

I think I'm an extremely patient person and I know that [her progress] is extremely slow. Everyday has some good things and some bad things. I feel like I have so much to do at this point [that I'm not sure] what my role is. I don't want her to feel like she's on her own. I guess I've kind of been through my frustration stage and now [I let her do the best she can]. I don't know, I just need somebody to give me some guidance because I feel like I'm floundering at this point. I just don't know what else to do. I know that she's not what I would approve of, but I don't care, it's not me. It's [her university] giving her the grade and the recommendation that she can be a teacher. I don't know if I would ever want to be the kind of person that said, "No chance in hell you're going to be able to do this. Just leave, forget it." I don't want to be like that. That's where we are.

Over the course of the yearlong internship, Melanie passed through many stages in her relationship with Patti. She began the year excited by the possibilities offered by the partnership, but became disillusioned as Patti did not make the expected progress. Eventually, Melanie resigned herself to the reality that Patti would not reach the level of competence Melanie desired.

Patti's Perspective

Patti described little change in her relationship with Melanie over the course of the internship. Patti did express that her level of comfort increased initially as she spent more time in the internship. Overall she was pleased with her relationship with Melanie and felt the

internship was a valuable experience. However, there were few references to her relationship with Melanie in Patti's interviews. Within the first weeks of the internship, Patti expressed the following thoughts.

Patti: [I've been] getting more into the structure of the classes and what they're doing in each class. [I've] tried to get to know who the students are and observe them and try to see how they learn. I'm not teaching the class, [but I'm] trying to become more familiar and have them start thinking of me as part of the classroom. Just getting a feel for her classroom and the students and the different personalities and the different styles of learning people have, it's been real interesting.

Basically, I'm real happy with things. I feel like she really cares about her students. I feel like she puts a lot of effort into trying to make them learn [and] doing different things with them. I feel comfortable [being here]. It's what I expected, it's working out real well.

In December, Patti continued to describe feelings of comfort in the internship.

Patti: I think things are going pretty well. I feel more comfortable. I think I've learned a lot, and I think there's always lots to learn.

In one incident in January, Patti felt that Melanie was frustrated with Patti's choice of activities.

Patti: While I was in Chemistry class, I started thinking that I had time [to] type out [the] transparencies instead of writing them. Even writing it ahead of time, my writing is not the best. I said, "I'll just go type up what I have and I'll print it out and put it on a transparency," and that's what I did. But I think it bothered Melanie because she said,

“You needed to pick something and stick to it. You’re not going to have time to do this when you start teaching a lot of classes.”

While Patti felt Melanie’s frustration during this one particular incident, it was not a reflection of the overall nature of the mentor-protégé relationship. Patti felt that she continued to progress during the internship and that Melanie provided advice and feedback that supported her progress.

Summary and Preview

Melanie and Patti’s relationship provided a rich opportunity to explore the research questions. Melanie provided Patti with advice related to both general pedagogical and pedagogical content knowledge. Topics addressed included many important aspects of pedagogy including engaging and assessing students, as well as thoroughly preparing for lessons and managing the learning environment. Within the domain of pedagogical knowledge particularly relevant to science classrooms, the pair discussed content that should be included as well as designing lessons for specific science topics while addressing common student misconceptions. Effectively planning for and implementing laboratories was another topic unique to science teachers the pair reviewed.

The research question that addressed mentor and protégé gains as a result of the relationship revealed different perspectives for the two members of this pair. As the internship progressed Melanie felt she made improvements in her abilities as a teacher and mentioned a change in her views of what it meant to teach science. Melanie, however, was not as certain of Patti’s progress.

The relationship between Melanie and Patti did have certain tensions. From Melanie’s perspective, Patti had characteristics including insecurity and reliance on Melanie that impeded

her progress. Melanie grappled with Patti's difficulties associated with content knowledge, preparation, and management. Patti experienced tensions related to the responsibilities of a science teacher, augmenting her content knowledge, and developing her own teaching style.

Over the course of the year, Melanie went through a series of stages in her relationship with Patti. They were: optimism, mounting concern, frustration, and resignation. Patti, however, felt her comfort level and abilities as a science teacher improved steadily. The following chapter follows a similar format and addresses the same four research questions from the perspectives of Jodi and Kevin, the second pair of participants in the study.

CHAPTER 5

KEVIN AND JODI

Chapter Five details the experiences of the second mentor-protégé pair in the study, Kevin and Jodi. Like Chapter Four, Chapter Five is organized according to the four research questions. The chapter begins with a description of the advice given by the mentor to the protégé, followed by a discussion of the gains each made as a result of the relationship, the tensions they faced in their work together, and the change in the relationship over the course of the internship. The chapter concludes with a summary and preview of Chapter Six.

Advice

As with Melanie and Patti, the structure of general pedagogical knowledge and pedagogical content knowledge was used as a framework to interpret the advice that Kevin gave Jodi during the internship (Borko & Putnam, 1996). Kevin provided Jodi with advice on a variety of topics within each of these domains. Figure 5 provides an overview of the topics included in each of the domains.

General Pedagogical Knowledge

General pedagogical knowledge can be thought of as “those broad principles and strategies of classroom management and organization that appear to transcend subject matter” (Shulman, 1987, p. 8). General pedagogical knowledge includes knowledge about teaching that is not necessarily subject specific. Timing and closure of lessons were the two topics Kevin addressed with Kevin in this domain.

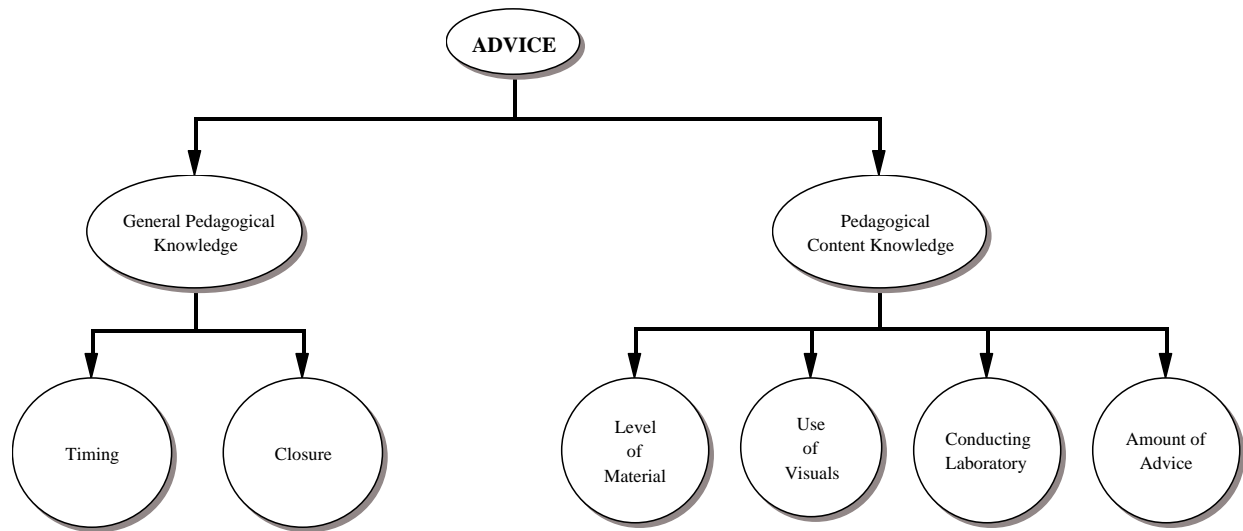


Figure 5. Kevin and Jodi-Overview of Advice Given

Timing. Advice relating to the timing of lessons was an area where Kevin guided Jodi with advice. When Jodi started her internship, she was unsure how long certain activities would take.

Jodi: I just planned it out and showed it to him and said, “Does this look like this might be about the right amount of time? I specifically asked him, “I’m concerned about the amount of time.” He [said], “Yeah.”

On the DNA PowerPoint, I showed it to him and I said, “I think this slide show is long enough where I don’t need to plan anything else behind it. I think that’s going to take up the whole period. We’ll be lucky to get through it. He agreed. I usually get an agree or a suggestion.

Kevin related another incident where he made suggestions about the timing of a bacteria lesson.

Kevin: Besides adding those shapes [and] the clustering of bacteria, we talked about speed. Second period she spent a lot of time on viruses and they didn’t get very far, and so now she’s not finishing all her notes today, but she’s getting through most of them. She sped up.

Closure. In four separate interviews, Kevin addressed the importance of including closure for each lesson. Kevin wanted Jodi to regain students' attention at the end of the lesson and summarize the main points. He advised Jodi to make sure to incorporate it into her lessons. Jodi did not mention closure in her interviews. The following interview excerpt highlights Kevin's feelings about closure.

Kevin: The only other thing I suggested was closure, going over all this terminology that we [covered], going over the terminology just to close and say, "Here are the important things that we need to remember."

In one observation after an activity that Jodi conducted using zippers to represent DNA molecules, Kevin again emphasized closure.

Kevin: What would you do differently? There's something that we need to do differently for the other periods.

Jodi: I thought it went well.

Kevin: [You] need closure. Why did we use the zippers?

Jodi: I tried to do that at every table. [I guess] the whole class would be better.

For Kevin and Jodi, topics of advice relating to general pedagogical knowledge included timing of lessons and the inclusion of closure. As Kevin observed Jodi teaching certain lessons, or planning for lessons, he made suggestions related to these two topics. In other instances, Jodi specifically asked for advice as she planned her lessons.

Pedagogical Content Knowledge

There were several areas pertaining to pedagogical content knowledge where Kevin furnished advice to Jodi. Most prevalent were gearing the level of the material to the students' ability level, using visual props to enhance student understanding, and planning laboratories for

efficient time and behavior management. While there were episodes where Kevin provided Jodi with advice on these topics, overall she felt that she received little advice from her mentor.

Level of material. One topic where Kevin supplied Jodi with advice was matching the level of science content to the ability level of the students in her classes. Excerpts from interviews with both Jodi and Kevin include references to advice relating to the level of the material. Jodi provided a summary of these types of conversations in the following statement.

Jodi: I do ask him a lot, "Does this seem too hard?" I just want to make sure it is going to be okay for their age level. I guess I'm still trying to judge what things they can and can't grasp.

During a conversation pertaining to a lesson on the structure of DNA, Kevin recommended that Jodi omit the PowerPoint slide that provided information about the numbering system for the deoxyribose sugar in a DNA molecule. He felt this material was too complex for students and unnecessary to fulfill the curriculum guidelines set out by his county. She kept the material in her presentation, however, because she felt it could help students better understand the concept of DNA. Jodi explained her position.

Jodi: He told me on my PowerPoint that I gave today that I should take that slide out that had the numbering in there, but I didn't. I debated whether or not to take it out or leave it in. I didn't take it out. I decided not to make them write it in their notebooks, but I still left it in there because I felt like it was important that they know the background. He thought it might confuse them, but frankly, sometimes if people know where stuff comes from- even if they don't write it down-but if they can see the five and the three come from a numbering system, then maybe it will click for them.

Kevin also mentioned the discussion about the DNA PowerPoint slide in an interview.

Kevin: *I think I told her to cut one section on the PowerPoint presentation. She actually got into the chemical bonds and what kind of bonds there were in between the parts of the nucleotide. I said, "They're not going to get that. They're not going to remember that, so let's stick to the three major parts, the nitrogen bases and all that." She's very detailed, and that's a good thing, but right now the kids are shutting down and I want them to get the basics. She went into that 5 and 3 stuff, which I never learned in high school. I told her to cut that down because we don't have enough time. She just wants me to look at [her notes] and see what I think-if [the material] is covered, and if it's too hard or if it's on the right level.*

Kevin also offered advice relating to the level of material in a lab on nonvascular plants. Again, he felt the material was more detailed than necessary to meet the needs of his students.

Kevin: *Today I gave her feedback on this lab. She was going to have them look at moss structures like antheridium and archegonium and it was just too detailed for the time we have to spend. I didn't look at those until I was in college. I said, "Let's get rid of this and let's make it a little bit more appropriate for their level.*

Based on Kevin's familiarity with the students in his classes and the curriculum guidelines for his county, he offered Jodi suggestions to help her gear her teaching to the requirements of his classroom.

Use of visuals. Including visuals to help students better understand scientific concepts was another area where Kevin assisted Jodi. In November, Kevin provided Jodi with specific assistance during a lecture. Jodi was teaching the students about the structure of DNA. During the lesson, Kevin realized that including a 3-dimensional model would contribute to the students' understanding of the topic. Both Jodi and Kevin commented on this lesson during interviews.

Jodi: *Second period had a hard time, but thankfully Kevin ran in [the storeroom] and grabbed out the model. I got to a point where I was showing a [PowerPoint] slide, and even though [there were] graphics up there, [we] still saw a few blank looks. He ran and grabbed a model [and] I think that helped. People see a flat thing on a screen, but seeing a 3D [model] can sometimes help. That was really great that he had that for third period. [The lesson] needed those extra props.*

Kevin: *Some of the kids weren't getting it, weren't understanding it. I remembered I had a 3D DNA model [that] could untwist and [you] could show them the ladder shape. I also had the lab I did last year [with] magnetic nucleotides that you can piece together yourself. I gave her those and we put [them] together on the board and helped demonstrate the nucleotides and how they attach, and the ladder and all of that good stuff. I think that cleared up a lot of things.*

In this instance, Kevin used his knowledge of available resources to help Jodi provide students with visual aids that would increase their understanding of complex subject matter.

Conducting laboratory experiences. Kevin provided Jodi with some advice about laboratories including how to prepare for and appropriately time the activities. Jodi described one laboratory in which she used zippers to model DNA replication and protein synthesis. As Kevin reviewed the lab, he shared some concerns pertaining to the materials for the activity. Jodi incorporated his suggestions into her planning. She described the conversation in the following excerpt.

Jodi: *His concern was that they'd mess up the zippers and so we wouldn't be able to use them for the transcription [and] translation [lab]. I think what I'm going to do is go ahead and draw the lines of the sections and then all they'll do is take the markers and*

color them in. Then if they [mess] up a couple of them, we'll still have plenty left. We just kind of talked through it.

Kevin mentioned advice relating to preparation for laboratories in his interviews. He felt it was important that Jodi understand the time necessary to adequately prepare.

Kevin: Jodi saw how to set up the lab and how days ahead we had to cook all the starch solution and sugar solution and get that ready to go. [We had to] wash out the bottles and get everything set up, and that takes- it takes two or three days if you don't sit down and do it all at once. You have to be prepared well ahead. I tried to give [her] little hints and say you have to get [everything] prepared.

Having plenty of activities for students to do on lab days was important to Kevin. This was an issue in a chromatography lab that Jodi conducted on a day that he was absent.

Kevin: [They] have to have something to do while they are waiting [for the strips to run].

Jodi: Second [period], they used a bunch of strips and I was worried I wouldn't have enough for the rest of the day. [We] didn't have enough to tie it in to what they were studying.

Kevin: Did you talk about leaves?

Jodi: No. [We] did talk about solubility.

In a later bacteria lab, Kevin provided Jodi with some advice about what students could reasonably get done in one lab period.

Kevin: [With] the bacteria slide, they had to draw certain things. We [were] doing three different viewer slides. Each slide has eight pictures on it. They could draw all eight, they could answer questions on all eight. That would be 24 different things. They couldn't get

that done in a period. So [I told her] what I thought was important on each one and she went from there. I gave suggestions on what she needed to include and what she didn't.

For the pair, it was important to make efficient use of their laboratory time. In the advice that he gave relating to laboratories, Kevin stressed the importance of adequate preparation and thoughtful timing to minimize potential management problems.

Amount of advice. While there were instances where Kevin provided Jodi with advice on a variety of topics, over the course of the internship Jodi felt she received relatively little advice from her mentor. She stressed, however, that he did always answer questions that she asked. Feelings of receiving relatively little advice were mentioned by Jodi in several interviews.

Jodi: We have little tidbits here and there where he'll say one or two things and then that's it. It's dropped and we move on. The other week I did a couple of periods and he made one or two comments, but very small and nothing significant. Hopefully he still feels confident in me. I don't know. I really don't know.

When asked about written feedback from Kevin pertaining to her lessons, Jodi made the following comments.

Jodi: No, I did not get any written feedback. Kevin's way of [providing] feedback is if it looks like I need help then he'll come in like when he brought in the [DNA] model.

Obviously I was having difficulty getting it across and so he ran out [and got the model].

Though Kevin did answer any questions that Jodi put forth relating to her teaching, she felt that Kevin did not volunteer advice on a regular basis.

Gains as a Result of the Relationship

Both Kevin and Jodi felt they had benefited from their mentoring relationship. Kevin hoped that Jodi had gained an understanding of the importance of having students “do” science

rather than just hear about it. He felt that as a teacher he had gained knowledge from Jodi pertaining to ways to incorporate technology into science instruction. Jodi felt that she had learned to be flexible in adapting to the teaching style of someone else and an appreciation for some techniques, such as group learning that she would be able to use in her own classroom.

Kevin's Perspective

Over the course of the internship, Kevin discussed gains that he felt Jodi made as a result of her experience. He also mentioned gains that he accrued from serving as her mentor. For Kevin, the biggest gain he received was an increase in his knowledge of technology and how it could be used to support student learning. Jodi maintained a website where she posted a calendar with links to class notes and assignments. She frequently used Internet resources in her lesson planning. Kevin discussed how impressed he was with Jodi's use of technology in several interviews.

Kevin: She did a wonderful job putting things on the website and having the PowerPoints available. She has all the stuff up there [on the website]. She's got email correspondence with a lot of the students asking her questions. On her web-site she's already posted the calendar about what we're doing. [On] Friday February 10th, we did an aquarium web quest. If you click on February 10th, it will take you right to the aquarium web quest. It's all linked together, it's almost like an on-line class. Here's your day; here's your activity. If a kid is absent it makes it [easy for them to catch up.]

When asked what he hoped Jodi gained from the internship Kevin shared the following ideas pertaining to his views of science teaching.

Kevin: The main [idea] that I'd want her to walk out [with] is to know it's better to do [science] than just talk about it. I got that philosophy-I don't know where I picked it up-I

hear it; I forget it. I read it; I understand it. If I do all three then I remember it really well. If they actually do science, it's easier to learn. It's easier to remember. Hopefully she's learning how to incorporate doing science instead of just talking and learning about it.

Kevin also saw himself as a sounding board for Jodi as she planned her lessons and reflected on their success.

Kevin: When we sit down to talk, I'll suggest little things-tweaking [the lesson], and adding suggestions and reinforcement. [I'll say], "You did a good job on this, you did a good job on that. You need to change this. How about trying it this way? How do you think you did today?" [I'll say] those kinds of things so she learns how to reflect upon what she did and why she did it that way.

Kevin summarized his mentoring experience with Jodi in an email after the internship ended. He again shared his thoughts about technology, but added information relating to his thoughts about the role of a mentor.

Kevin: I gained many new understandings from this partnership. I learned that my way is not [always] the best way, and that lessons can be motivating in many ways. This partnership reinforced the fact that mentors and mentees must be flexible. One [cannot] be possessive of their time up in front of the classroom and [must] be willing to let the [protégé] "experiment" with their own lessons. I also learned that at times the mentor has to "be the boss." It would have helped our partnership if I was more clear on what I expected and [that I was willing to] help, but it would be Jodi's responsibility to plan, set up, and teach the lesson. The greatest gain was all the technology that Jodi brought into

the classroom. I learned about websites and creating assignments that are enriched with movie clips, pictures, and text from the Internet.

Though there were difficult moments in Kevin and Jodi's partnership, Kevin felt they were both able to gain from the experience. As a mentor, he learned about characteristics he needed to bring to the relationship to encourage its success. As a science teacher, he learned more ways to incorporate technology into his teaching. Kevin felt that Jodi gained from her experience as she was able to see Kevin as a model for having students do science rather than just hear about it and she was able to use Kevin and his experience as she talked about planning and implementing her lessons.

Jodi's Perspective

There were several areas where Jodi felt that she learned as a result of her internship experience. These included developing a modified view of science teaching, a comfortable relationship with students, and an understanding of how to age appropriate materials.

Jodi was comfortable with a more structured type of class than Kevin. This did cause tensions in their relationship, however, having a mentor with a different teaching style than her own helped Jodi see other possibilities for how students could learn science.

Jodi: Second period he decided to feed the snake. Instead of making that a situation where they couldn't watch, he turned that into [a learning opportunity], answered questions and let the kids watch. Biology is about living things, and he does have all those fish and animals and a lot of things for the kids to look at and interact with. If somebody asks something about the [animals], he'll take a minute to talk about it. It may not be specifically about the curriculum, but it's about life in general and the way things work. That's a really neat thing about him I think.

Near the end of the internship, as Jodi reflected on her teaching style differences with Kevin she made the following comment.

Jodi: Nobody's going to give you everything you feel like they should and more. There were some positive things that he gave me. He's very relaxed and I would have preferred being with someone who was a little more structured, but on the other hand, it was good for me. It was a little bit out of my comfort zone, but sometimes that's not always a bad thing. I think that as far as running a controlled environment, I have become a little bit more flexible with that.

Discussing her experiences with learning to gear the material she was presenting to the level of the students in Kevin's classes, Jodi conveyed the following thoughts.

Jodi: I think what I'm learning is how to be appropriate the information because I haven't worked with a younger group like this before; always adults. I'm learning how to translate the information that [I] want to get across and simplify it in a way that they can understand it.

Jodi expressed her feelings that she had grown more comfortable in the role of teacher as a result of her internship.

Jodi: My major growing area has just been overcoming my fears of being in the room [and] not knowing what it was going to be like. I'm a lot more comfortable with the kids. That's a huge thing because I hadn't been around kids in forever. Sometimes they do push me a little, so now I'm learning where my comfort zone is.

Though there were difficult aspects of her relationship with Kevin, Jodi did think that the overall experience had been a beneficial learning opportunity for her. In particular, she adopted a somewhat more relaxed view of what science teaching could look like; she learned to gear

curriculum materials to the ability level of the students; and she became more comfortable in the role of teacher.

Tensions

Kevin's Tensions

During the internship, there were several areas of tension for Kevin. One area discussed by Kevin was the lack of personal connection and communication between himself and Jodi. Kevin expressed concern over the quality of the job he did as a mentor as a result of personal circumstances during the internship. As he addressed Jodi's ability to effectively teach science courses, Kevin worried about her seeming hesitance to take primary responsibility for teaching his classes, her perceived unwillingness to use other people's resources, and her apparent lack of preparation in some instances.

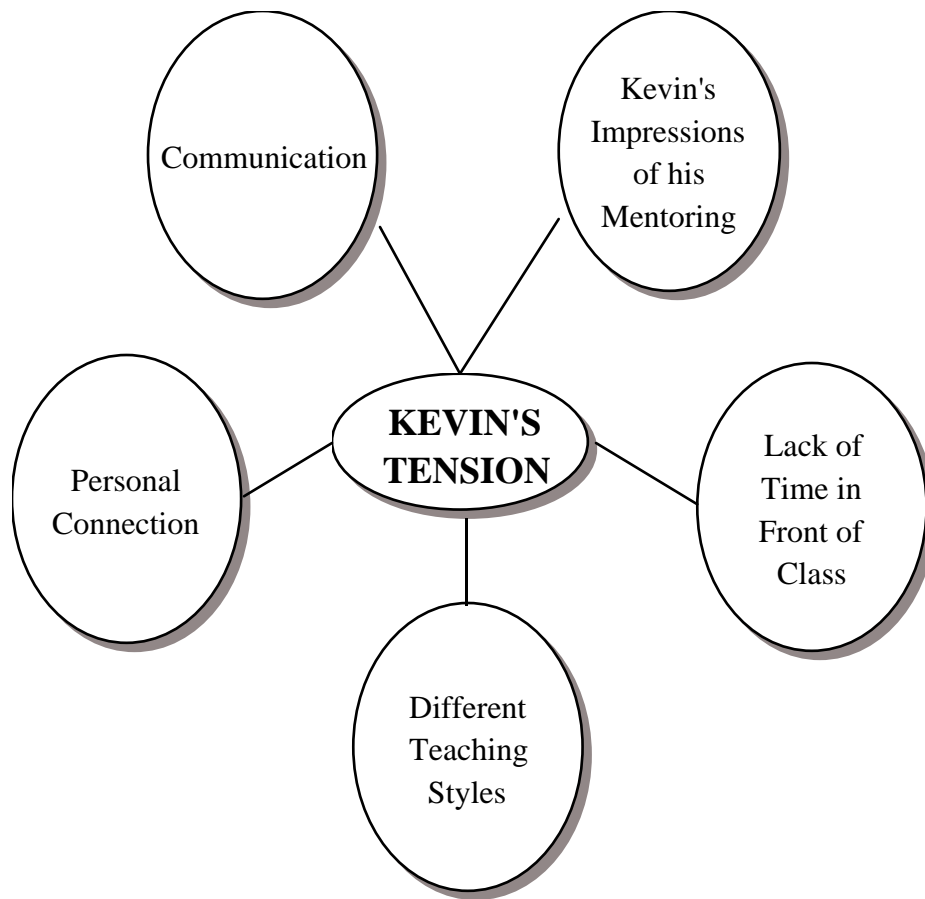


Figure 6. Overview of Kevin's Tensions

Personal connection. Kevin and Jodi established a working relationship over the course of Jodi's internship. They did not, however, develop a close personal relationship with each other. Kevin explains his feelings about the relationship in the following passage.

Kevin: We don't have that personal connection. I find it frustrating that I can never get in touch with her. She has an answering machine and she has a cell phone and I've talked to her once when I needed to. Monday we had an early morning [staff] conference, so I called Sunday and invited her, but I didn't get a reply. I mean there's just no [personal connection]. It's just my personality [but] I don't think I've really gotten to know Jodi and that's a bad thing I know, but that's just me. Warm and fuzzy is not me. I

just want to find [out] what I need to do and I'll do it and get it done because I have so many things to do. Jodi's just a little harder to read. She's business-like too. We're both like that, so we're both real focused on what we're doing. Every other word is all right, what have I got to do next? We just look for the next thing so we can get everything done, and we've been very productive. It's not a bad thing but it's just not warm and fuzzy. I've never gotten together and taken her out to dinner. We talked about that in the mentor class-making that connection. I haven't done that. I don't know if I haven't felt welcome to- I just haven't done it.

Communication. During the course of the relationship, communication was an issue for Kevin. There were several instances where the two had not had discussions that Kevin felt were important. In the following excerpt Kevin refers to a lab on fungi that did not go well.

Kevin: I haven't made her do detailed lesson plans or anything like that. I see Fungi Lab and so I assume that she's gone through it and she's read through it and done all this stuff. I need her to ask questions to me [such as], "Do you think this will work, [or] I have this concern." [Her] concern that she thought this was not a good lab was never brought up to me. We could have said, "Here's a lichen, draw it. What do you see? Look under the microscope, look for green and look for gray and see if you can see the algae and the fungus-" simple things. We could make our own lab and then maybe use some of the questions from the old lab. But if I don't know there's a concern, I'm going to say, "Hey, she must be happy with this and I don't want to step on her toes." I don't want to [tell her what to do]-she learns by messing [things] up. So if there's a concern, I'll be glad to help, but if the concern's not raised, then I [have no way to know that the lab] was going to be a difficult situation.

Kevin's impressions of his mentoring. During the first semester of Kevin and Jodi's work together, Kevin and his wife had a baby. Kevin took time off to be home with his family during this period. The time commitment involved with his new child led Kevin to question the quality of the job he was doing as Jodi's mentor.

Kevin: It's the inconsistency where I'm here and [then] I'm not here. That gets to me, and it's getting to my teaching. It's getting to everything and I need to get focused. I'm just flying by the seat of my pants this semester and it's catching up. A lot of things are just chaotic, but that's what having a new child does.

As a mentor, just because I'm so overwhelmed, I don't think I'm doing a good job. That's just because I haven't been here and I'm overwhelmed and everything is piling on top of me, but I'm sure we can find some good in [what we're doing]. I would question how good [of] a job I'm doing. If I'd have known that it would have bothered me this much after having a baby, I probably would have said no [to being a mentor]. I know I have excuses, but I don't use excuses-I just haven't done a good job.

I know I have taught her stuff. [But] have I done it well-organized and well thought out? No, I haven't and that's my fault. I'm just worried about not doing a good job. Hopefully, I think I can be a good example and teach by example, so I think that's where most of my mentoring comes.

Because of the demands imposed by changes in his personal life, Kevin was concerned about how well he was able to fulfill his responsibilities as Jodi's mentor. Even within his concerns, however, he felt he was able to help Jodi learn by his example as a good science teacher.

Lack of time in front of the classroom. Because Jodi's internship lasted the entire school year, Kevin and Jodi had to negotiate each person's responsibilities for the classes over the course of the year. This negotiation was a source of tension in the relationship.

Kevin: I get frustrated that she's not up there. I know a big struggle for student teachers is [for the mentor teacher to say], "I'm taking my hands off. I'm not going to do anything." The one time I said that she kind of got offended and said, "Oh, you'll have an easy semester." That bothered me. It's a stressful situation.

Kevin felt that he and Jodi established a relationship that was collaborative in nature. As the year progressed, Kevin came to question whether this was an effective model for a mentor-protégé relationship.

Kevin: I know she's learning a lot and I know she's getting valuable experience, but I think we're doing it more as a collaborative thing instead of me being a true mentor and being above her. I've tried to show her and it's become more of a collaborative thing where we're both working together, and I won't do that again. I did that last year and [the problem is the protégé] becomes too familiar where it's a collaborative thing and not an intern/mentor thing. They don't try to impress anymore. I need to become more authoritative in my mentoring. We tried to do this collaborative thing and I think if I was more regimented and said, "Do this this week, let's add a little more each week," then she would be more comfortable [teaching in front of the class]. But doing the collaborative thing, there's always me to fall back on and I think that actually does a disservice in the long run. That's one of the hard things about [this program], is that these people know a lot, and they know the science but they need the experience in the classroom teaching in front of [students].

Kevin initially was satisfied with his collaborative relationship with Jodi. As more time passed in the relationship, he became concerned about this model because he felt that in part it allowed Jodi to avoid spending time in front of the classroom. He believed that it was important for her to have some units for which she did the planning and teaching for all of the lessons. While he felt that she had excellent organizational skills, he believed that she was not getting a sense of the real work of teaching because of his belief that she was reluctant to get up in front of the class.

Kevin: She does a great job when she's up there. I don't know if she hasn't developed the confidence to stay up there. I hope it doesn't sound like I'm just trying to get out of teaching, that's not why I'm doing it. But if she wants to be a teacher, she needs to practice teaching. We'll sit down but then when I put in my two cent's worth, if she doesn't have anything, then we use my materials [and] then she doesn't feel comfortable. Then I get the excuse- "I don't want to be up there doing your stuff." If you don't feel comfortable doing my stuff, then you've got to get a plan and you need to get it planned ahead of time so we can look through it and see if it would work or not. And if it doesn't work, you learn from it. If it does work, then pat yourself on the back. But you have to get on the horse to ride it. I want her to get practice teaching

Yesterday, she got tons of stuff done. I'm not taking away from [that]. She graded all her papers from last week and she got all that stuff [entered into the computer] because progress reports were coming out. If she hadn't done that, I wouldn't have gotten a full progress report out. But I was up teaching and she was supposed to have a whole month of teaching. So what I'm seeing is that she could plan one week, but then stuff that goes in between is falling through the cracks. That's where I'm worried that

she doesn't understand the whole scheme of things. [As a teacher], I have to be able to grade papers. I have to be able to plan the lab. I have to juggle all those different activities. I don't think she wants a job as a secretary. She can do the paperwork, but she needs to be able to do the teaching and the paperwork.

We had it set up from the beginning of the semester, she was going to teach microorganisms and plants, which covers almost an entire month. But that's not happening. Something always comes up. I used to think it was my doing. I don't think it's me doing it anymore. I think she just doesn't want to be up front. I had the same problem with [my intern last year] though, so maybe it is me.

She does a great job in planning and designing things. The websites, the web quests, all that stuff is just awesome. She does a great job doing it, but that's not even half the job. It's not even a quarter of the job. There's so much more that has to go on. And we have two people here so it's easy to go back there and grade papers and do stuff in class. But she's going to be on her own. If she gets a job, they're not going to put her in a collaborative situation. It's going to be her and only her, and she's got to do all those jobs.

One factor that contributed to the reduced time that Jodi spent teaching Kevin's classes was her reluctance to implement lessons he had designed; she felt more comfortable being responsible for her own lessons. This was a concern for Kevin, he felt that Jodi used her unwillingness to use his activities as a way to avoid more time in front of class. He was also concerned that as a new teacher, she would need to borrow materials from other teachers to avoid being overwhelmed by planning her first year. Kevin discussed the events of one day

when he managed a lab that was one of his activities even though the pair had planned for Jodi to be responsible for the lab.

Kevin: Monday we did the shark lab. I jumped up, just out of habit. Then second period I was like, "Wait, she's supposed to be teaching." And then we sat down and talked after second period. I said, "I apologize for jumping up." I didn't want to offend her [that I had done the lab]. She said, "No." We figured out that I know the tricks of the trade of my activities. So she doesn't like to teach my activities for some reason.

Well, if you're not flexible enough to use somebody else's [materials, that means you're planning 180 days for the school year. If you've got two preps, that's 360 things you've got to plan. It's just too overwhelming for someone to do that, especially when you're a first year teacher, it's an overwhelming task. There's no reason to reinvent the wheel. If there [are] labs, good labs that already exist, you can teach them. You can modify them without spending three to four to five hours on an activity. Thinking down the road, that might be a problem if she can't be flexible to adapt to someplace else.

You're going to be [there] until 10 o'clock every night, and it's so much better if you can find a buddy. You do some of their activities and they do some of your activities and you help each other out. That's something that's reared its head [as a problem] is inflexibility, or not being able to adapt to a situation.

As Kevin analyzed the factors that contributed to his perception that Jodi did not spend enough time teaching his classes, one factor that concerned him as that he felt Jodi was unwilling to use his materials. Kevin believed this tendency of Jodi's could prove to be a problem for a new teacher.

Preparation. Another area of concern for Kevin involved Jodi's level of preparation for the lessons that she was responsible for teaching. Kevin did not mention this concern during the first semester, however, it was a frequent topic in his conversation during the second semester.

Kevin: The only thing that I'm worried about is [that] I don't have plans for next week, so I don't know what we're starting. We're doing this real quick unit and then she'll start on Monday on plants [and] I don't know what we're doing yet. I usually have things Xeroxed by now.

Farther into the unit on plants, Jodi's failure to plan ahead of time and prepare thoroughly for her lessons continued to be a concern for Kevin.

Kevin: She wasn't prepared last week and she's not prepared this week. I saw that because she's focused on what she was doing last week and didn't connect it to what she's doing this week. We've got the second week of plants and right now, she's scheduling for one day. She spent yesterday grading papers and today for the last three of four hours, she's planning one day's activity and I think that's because [her university supervisor] is coming to observe. And I'll just say it, it's got to hit the fan tomorrow where I have to say, "We need to be planned at least two weeks ahead of time. We need to know what's going on."

She brought in some lichen and she went and got all the mushrooms, and then we were looking at the gills inside the mushroom under the microscope. Well, she hadn't done that ahead of time and so she didn't know what she was looking for and what the students were looking for and that was disconcerting. We started second period and in the middle of second period she comes up and asks me, "Do you know what these are

supposed to look like?” [That] was a surprise. That was a problem, I felt she wasn't prepared.

Kevin discussed his concerns about the pre-laboratory preparation for the fungi lab. He was concerned about Jodi's preparation to conduct the lab. He questions his own role as a mentor as he relates the story.

Kevin: I tried to give little hints and say, “You have to get here early and you have to get this prepared.” Well, she wasn't there and I ended up putting all the tables together and the lab groups. I got out all the extension cords. I got out the microscopes. I did all that stuff. That's something a mentor has to really think about, am I doing them a service or a disservice. Am I going to help them or not help them? So I struggling thinking maybe I shouldn't do any of this and just let her come and see what happens. The big picture, all the preparedness things, I don't know if she's grasping that yet.

Different teaching styles. One further tension in the relationship between Kevin and Jodi centered on their different teaching styles.

Kevin: There is actually a methodological difference in our teaching. I guess I am more confident and I am more direct and I don't rely so much on the information, but [on] doing the science behind the information. Hopefully, [the students will] understand the information as it comes. But she being a new teacher, she wants to teach. She does a good job of reaching and enriching the kids. I don't even talk about the 5 and 3 prime [end of DNA] and how things attach because time-wise I want to focus on those major objectives and facts that they have to know. I [hope] that they will just remember those instead of saying okay, here's the big picture like she does.

For Kevin, the primary tension that arose in his relationship with Jodi was that although present daily, he felt she was reluctant to actually get up in front of the class and spend time teaching on a consistent basis. Tied to this tension was Jodi's expressed reluctance to teach materials that Kevin had prepared. In addition, the pair suffered from a lack of personal connection and communication. Though he felt that Jodi learned as a result of being in his classroom, Kevin questioned the quality of the job he did as her mentor as a result.

Jodi's Tensions

Jodi shared Kevin's concern pertaining to the lack of communication between the pair, but she had other unique tensions of her own. Jodi felt uncomfortable because of her position as an intern in Kevin's class. As the year progressed, her perception of Kevin as a teacher changed and she felt that he was not serving as a good role model for her. Contributing to this changing perception were several stories that Kevin told students that Jodi felt were inappropriate. Jodi felt that the different personality and teaching styles exhibited by herself and Kevin increased the strain on their relationship. The mounting tensions between the pair culminated in a tension-filled laboratory day that eventually led Jodi to change her internship schedule.

Lack of communication. For Jodi, one of the difficult aspects of her relationship with Kevin was the lack of communication the two experienced throughout the internship. This lack of communication extended to many areas of their work together such as planning for lessons and discussions of her teaching. In the following excerpt Jodi described an incident that occurred because Kevin had to be absent due to his son's illness.

Jodi: I wasn't here on Thursday and then when I got back on Friday he was weird. I don't know if he was weird because [I sent] him emails on Thursday. I [said], "Did you get my emails?" He said, "[Yes], I tried to call you." I think he was bugged that he

couldn't get a hold of me to tell me what was happening. We really haven't had a chance to talk much. It's just been crazy so really all we've been trying to do is just make sure we have everything planned enough to get through the past two weeks with his baby [being sick].

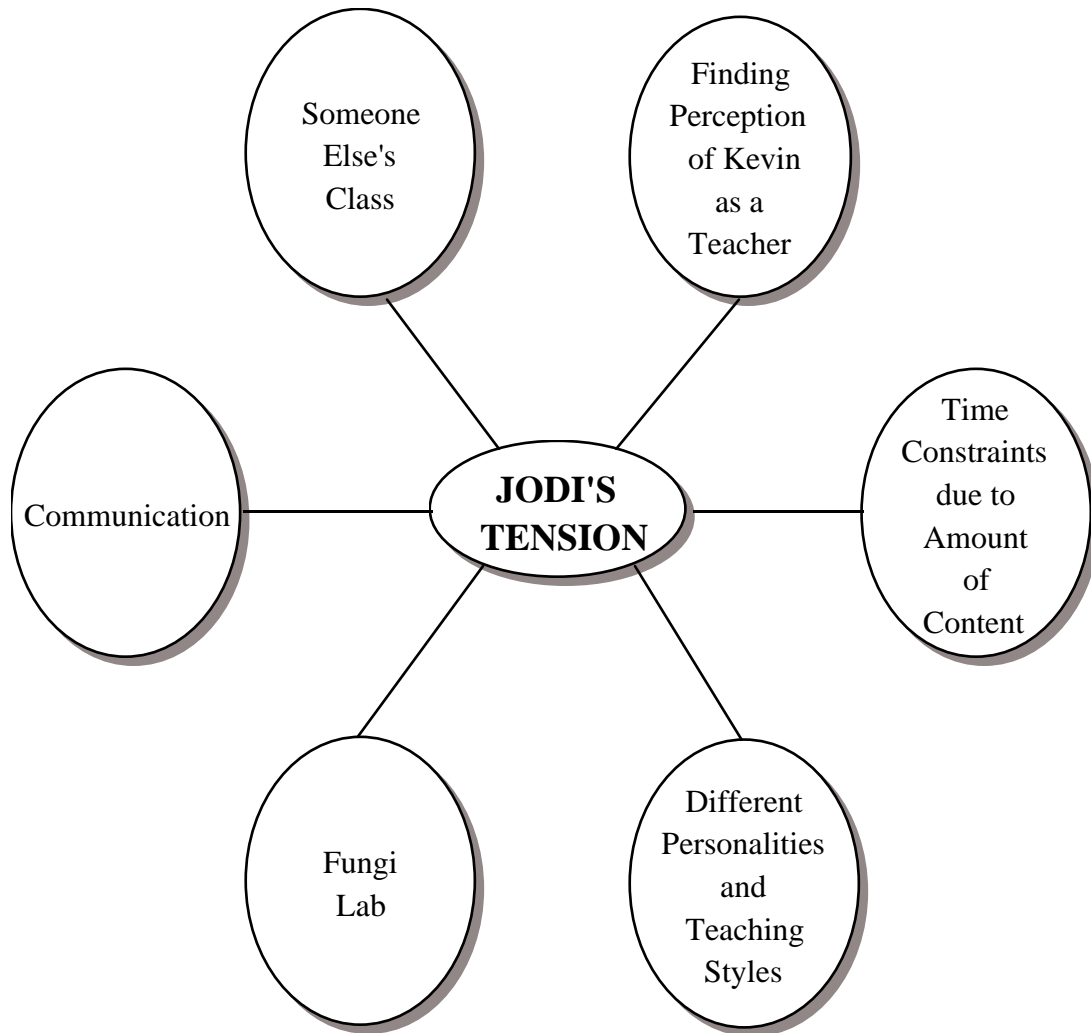


Figure 7. Overview of Jodi's Tensions

Jodi discussed one incident where she tried and failed to initiate conversation with Kevin about the planning she needed to do for a unit on microorganisms.

Jodi: *I had to ask him, “Well, what exactly is microorganisms? What do we need to cover on it?” [His answer was], “We need to cover viruses, bacteria, protista, fungi, and algae.” So, that’s all I get. Then [he says] to go search his files. [It has] been hard to get him to sit down and plan with me.*

Jodi summarized some of the difficulties she has experienced in trying to communicate with Kevin in the following passage.

Jodi: *As a teacher you almost communicate TO those kids. But when you’re with an adult, you don’t communicate what you want to that person, you communicate with them. And it’s a different process. I was real concerned about having a man as a mentor because it’s just-there’s no friendship there.*

One of the specific types of communication that Jodi felt was lacking in her interactions with Kevin was feedback on her performance in the internship. This absence continued to be a problem for Jodi throughout the internship. When asked about feedback, she explained that she received neither verbal nor written feedback.

Jodi: *There are some things that still concern me. I’m not sure what his confidence level is like in me. If I can just get him to talk about [my plans before I] am up there [in front of class] instead of waiting for me to get up there and present it before he says something, that’s the main thing. That’s why I am trying to initiate pre-discussions. He may be just waiting to see if I can handle it. I’m wanting feedback ahead of time, and what he may be wanting to do is to see how I do and then tell me. We’ll see. It depends on what his agenda is, which I don’t know yet.*

In one instance, Jodi began to have feelings that led her to question her ability to teach high school students. When she discussed this with Kevin, he did not provide her with the positive feedback that she needed to allay her concerns furthering her frustration with him.

Jodi: When I told him that [I] didn't think I was a very good teacher. [His response] was "Well, the only problem I see is like the lab the other day, you just should have done the lab ahead of time, done it yourself and planned it out. I said [to myself], "You know what, I didn't ask for a critique right then."

In Jodi's view, she did not experience open and frequent communication with Kevin. While he would answer her questions if asked, he did not volunteer input. This lack of communication was problematic for Jodi.

Someone else's class. Jodi discussed the fact that it was difficult to feel completely comfortable as an intern when you are in someone else's class who already has a system and style in place. Jodi related this experience of being in someone else's classroom to her work as a manager in a retail store.

Jodi: It's not really my place. I'm in his classroom. I'm learning in his classroom. This is the way he does things and so basically I just suck it up. What else can I do? I mean if I wanted to do all the lessons and totally take over the classroom, if I were to broach that subject, I think it would become a- "If you don't like it, do it yourself kind of thing." It's not that he [acts] like that, I can't really complain because it's his class and that's the way it is. We just go with it, but it is a source of frustration.

When he's there [I feel more uncomfortable] and that may be a preconception of mine from my store because when I was in somebody else's store, I'd be happy to help and do what I could, but it's [their] store. [They] make the decisions. If [they] decide to

do it that way, I'm going to support [them], but I certainly am not going to come [in] and take over. It's the same kind of thing. Out of respect for him, and everything in his classroom, I do step back a bit more when he's there. [That] probably isn't what he wants to see, but then again I don't want to step on anybody's toes either.

Jodi is also sympathetic to Kevin's perspective on this issue and the difficulty involved with hosting an intern for an entire year.

Jodi: I'm sure it's so buggy to have somebody up in your space all the time. He's got to get annoyed with having me there sometimes, [he] just couldn't help it. It's like having your relatives come and stay at your house for more than three days. After that, you're done with them. I'm sure he's looking forward to a break from me. He's so low maintenance that I'm probably really annoying sometimes to him when I keep [asking] him, "So what did you think? What did you think?" I'm sure he gets real [bothered] sometimes. I would, I'm sure.

Perception of Kevin as a teacher. Jodi's frustrations in her relationship with Kevin grew over the course of the spring semester. She felt that she was not getting the help that she needed to grow as a teacher from her work in Kevin's class. One feeling that Jodi had that contributed to this frustration was her view of Kevin as a teacher during the spring semester.

Jodi: First of all let's start back at the beginning of the semester. Kevin is completely toast as a teacher of this course. Ever since Christmas he's just not been together, not into it. [He] has way too much other stuff going on in his life. [He] makes a comment about once a day about how he's got this other class going and he's sick of teaching 9th graders. He's even said to the kids, "Oh no I'm teaching oceanography because I don't want to teach 9th graders anymore." That's fine, that's his deal, but it's not very

motivating. Let's just say that. It's hard to stay excited about something when somebody else isn't.

In the final interview of the study, Jodi did indicate that she felt Kevin's attitude had changed from her perception at the time this interview occurred. She shared that she felt he had been more excited and enthusiastic as the second semester progressed.

Related to Jodi's perception that Kevin suffered from teacher burnout was her concern that some of the stories that Kevin shared with the class were inappropriate. She thought that Kevin felt he was building rapport with students, however, Jodi found the stories offensive. The following is an example of one story that Jodi found inappropriate.

Jodi: I think [he] was talking about heterozygous and homozygous and the chromosomes and all that kind of stuff. He was trying to introduce the [vocabulary]. He [said], "You know when you go down the hall and you call your friend hey homo, hey homies." He says, "That's because homo- you know those are the people [who are] same sex with same sex," and he just went on and on. "And then hetero-, is like us and hetero is opposite." So people kept going, homosexual instead of homozygous. First of all, it was offensive to death. I must have been glaring at him all day because finally by the end of the day in the last period [he stopped using it]. About the second or third period, he [said], "Okay I know that you know you have to be careful," and he started qualifying it. By the end of the day he finally dropped it. I [thought], "That is so offensive. That is just so not a good analogy to use. Homogenized milk would have been excellent."

Time constraints due to amount of content. The limited amount of time available to cover a large amount of content was an external constraint that added tension to Kevin and Jodi's relationship. Jodi discussed her feelings about these constraints in the following narrative.

Jodi: *It was really hard [to plan the unit] because [there] was so much [information]. Think about microorganisms, I had a whole semester [in college] just on bacteria. It's really cool stuff that I love. But the [topics] I like are not the stuff that he likes and so it gets [compressed]. He doesn't give time to [those things] because that's not what he likes to do. He just figures it is going to be skimmed. I really like [microorganisms] and I feel like it's important and so for me to pare down the information that they need to know into a week that has a test in it [is extremely difficult]. That's four days of instruction. I think he was [bothered] that the grades were not good on that test. He thinks that's going to make him look bad. And he's thinking, "Oh they did so well on my test." They also spent three weeks [learning] how to use a [dichotomous] key, and half of their test was on it. [I had] four days and a test.*

Differing personalities and teaching styles. One major source of tension for Jodi that became more apparent as the internship progressed was the distinctly different nature of the personalities of the pair. She felt that she thrived in an environment that was more organized and structured, whereas Kevin was comfortable with less structure. These differences in personality translated into differing teaching styles that became more apparent as the year progressed.

Jodi: *I do tend to be a little anal about my stuff, so frankly it's probably good for me. Maybe he can loosen me up a little so maybe I don't have to spend 12 hours writing a lesson plan. I do tend to sometimes make things a lot more difficult than they need to be. Sometimes, he oversimplifies a little bit. So, maybe if I end up somewhere in between that would be good.*

While Jodi was comfortable with the difference in personality initially, eventually it began to pose problems. Differences in preference for structure carried over from Kevin and Jodi's personality into their styles of teaching.

Jodi: I'm just a little more-I don't like the word regimented, but I like a little bit more control in my classroom. He can deal with people being all over the place and wild and stuff like that. I think there is a time and a place for socializing and group learning and that kind of thing, but I probably would have a little bit more balance as far as traditional learning versus group learning. Maybe it's because I'm so involved with helping them when they are getting through [their activities, but] I see a lot of non-on-task time.

He just does tons of that group stuff. I really like to keep those kids on track. It doesn't bug him if there's a couple of people not doing what they're supposed to and it really annoys me. We have a few differences that way. I do think that hands-on is really important, but I think that will be something [where] I'll find my own comfort zone in time because the way I would have them do [things], or the things I would have them do might be totally different than the kind of stuff [we do in Kevin's class]. I think that it's important for kids to do [science], because all the theoretical stuff is fine, but it's certainly not as fun or effective for them as having a hands-on kind of thing. I think that he's been teaching long enough, there's a lot of things he would set up and feel comfortable [with that I wouldn't]. Plus, he's a guy too. It's just a much more controlled environment when I'm in charge than when he is. Not just controlled, because he controls his chaos very well and he can deal with that okay. Mine is a little calmer.

As previously discussed, Kevin and Jodi had different levels of comfort concerning the amount of structure involved in a lesson. Kevin was also more comfortable improvising within a

class period or over the course of the day. This frequent change of plans was a source of frustration for Jodi.

Jodi: He came in and said [the students were] going to have to do something else before I could get started. So I had a transition that I had not planned on and that really threw me for a loop. It was hard to get them focused back on what they needed to do to get started with the sports equipment lab. Then in fourth period, he interrupted a couple of times and so fourth period was really a nightmare. When he throws those little loops in on me-I haven't learned yet to segue unless I've planned on how I'm going to handle it. I'm not experienced enough to be thrown a curve ball and still be able to stay with the swing and hit it.

In the following section Jodi further explains how she felt uncomfortable when she was asked to teach the class using materials that Kevin has organized and developed.

Jodi: That's an issue. It's really annoying to have to present something that is somebody else's material because you are in there totally winging it. It's not something you prepared yourself or thought through yourself. Today I saw him go through the slides, but then to have to take [over], that's really annoying to me to have to pick up in the middle when I don't feel like I am prepared. I know the material and I know the content, but I don't know the presentation. I'm not familiar with it and [the way] he organizes things [for presentation] are not necessarily the way I would organize it to present it. I'm having to present someone else's ideas which is difficult. [When it is a day that I know I am teaching], I am prepared to go into my day because I know what I am doing and I planned my activities and so I felt comfortable with things. I know I am going to be

running it from the start, not halfway through the period, all of the sudden “You take over,” which is really annoying to me.

Fungi lab. While there had been some tensions along the way in Jodi and Kevin’s relationship, neither member of the pair saw them as insurmountable. However, there was one critical incident that caused Jodi a great deal of anger. During the spring semester, Jodi planned and enacted a lab dealing with fungi. There were several problems with the lab when she implemented it with the students. She was frustrated because she felt that she had expressed her concerns to Kevin and he had not helped her address them. Her experiences on this day contributed to her decision to reduce the amount of time she was present in her internship.

*Jodi: I kept telling him I was having a hard time finding a lab for last week. I said I had one [but], I [didn’t] think it was going to work. First of all I don’t know jack about plants. Anyway, I said, “I don’t think it’s going to work.” [His response was], “Oh yeah, we can make it work. We can make it work.” So he went on this hike and he found some stuff and he brought it in and I went and I bought stuff. I bought mushrooms and all this kind of stuff. I don’t know what a mushroom basidiospore looks like and I don’t know how to get one. That was what the lab was about and had he taken two seconds with me to actually look through that lab, he would have seen it too. He flipped through it, but he didn’t look at it. The day [for the lab] came and we got it all set up and everything and I bought mushrooms. [When we did the lab], nobody could find what they were supposed to be looking for [on] their slides. He said to me, “Well they’re not going to find it on that because these are refrigerated ones.” And I thought to myself, “You little f*****.” Then he looked at me and he [says], “Well this is just not working.” He was looking at me to fix it and [I thought] I can’t fix it, I have no idea any kind of subject knowledge*

about this to tell them what to do. So he said, "We'll try and walk them through it on the next one." Well that was screwed up and then he said, "Okay, well that didn't work." By then he was [annoyed]; he said, "What do we have planned for the rest of the week?" I [said], "I have a crossword puzzle that was scheduled for tomorrow that we could give to them to do." We were doing a microviewer lab the next day and I knew it wouldn't take them very long and so I had planned the thing out. So we ended up having them do that and then we just were going to give them a grade for the day. It didn't even dawn on me when I gave them that [there wouldn't be enough planned to fill up the next day]. The next day he was gone and we were doing the microviewer lab which went really well. They got done in 30 minutes and then they didn't have anything to do. And so I told them it was going to be a study session. I [said], "Fine, when you get done, you're going to need the time to study." That was really, really hard to control and I was left again with a situation with lots of time and nothing for them to do. That just is so aggravating for me. Then he blamed me for that lab saying, "Well, we should have just gone through it and made one up." I said, "Yeah," but I kept telling him I didn't think [the] lab was going to work, but he didn't listen. And then it's my fault. I went home this past weekend and I thought, "That's it. I don't even think I want to be a teacher anymore. It's so not fun. It's not a good environment. I just don't even want to do it anymore." If there was a way I could get out of this semester and not ruin my grade point. I would do it so fast.

The thing that really [made me angry] with that whole lab thing-I guarantee that if you asked him if I had said that this lab wouldn't work, he wouldn't remember that because men don't listen. I got so [mad] when he was blaming me for that day. And [I thought], "You know what, I told you about it, at least six times. I don't think this lab is

going to work, do you have anything else?” [He said], “You can go look in the files.”
Well, I looked through the files and there wasn’t anything.

Kevin and Jodi experienced many tensions in their relationship with each other. For both of these participants, their lack of communication and personal connection was a problem. Both also recognized that their teaching styles were different posing problems in some instances. Though the two shared some of the same tensions, there were areas where their concerns did not overlap. Kevin was troubled by Jodi’s perceived reluctance to spend time teaching the class. Jodi felt the strain of spending so much time in someone else’s space and the time constraints associated with a large amount of content to cover in a short amount of time.

Change in Relationship Over Time

As Kevin and Jodi described the change in their relationship over the course of semester, they both described a similar pattern of feelings about the relationship. Each began the year optimistic and pleased with the relationship. As the year progressed both began to express some concerns. By spring the members of the pair felt many tensions associated with the relationship. Following a critical incident with a lab in which both were unhappy, they implemented a new schedule for Jodi. The change in schedule facilitated a resolution of many of the tensions that had developed.

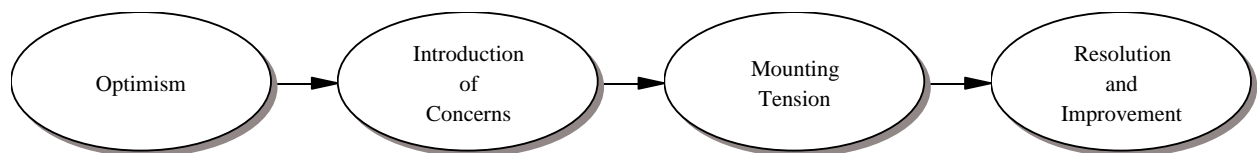


Figure 8. Kevin and Jodi’s Perception of the Change in Their Relationship

Kevin

Though the internship only required that Jodi be present in Kevin’s room for 20 to 25 hours each week, she opted to be present on a full time basis. This arrangement lasted until the

spring when Jodi cut back to the number of required hours. Over the course of the school year, Kevin's relationship with Jodi went through several cycles including optimism, periods of concern, and resolution.

Optimism. Kevin was excited about his work with Jodi as the year began. He contrasted his perceptions of Jodi with those of his previous protégé and felt she had much to offer and was an asset to the class.

Kevin: When she came, it was a big help. She helped me put in email addresses for all my students and that kind of thing, it helped so much. It's been pretty much a collaboration. [We did an activity] outside and she was knowledgeable about the trees. She took one half the grid [and] I took the other half. It's [like] having a partner instead of a [protégé]. We're really just doing a partnership and doing collaborative teaching.

Her outgoing personality helps in teaching. The people skills are there already. There hasn't been a lot of teaching going on because she's on top of things, and it seems like she knows the content. She has a lot of confidence and that lets me have confidence in her. Planning-wise, she's taken the initiative. [In] planning things out, [we] get her ideas, [we] get my ideas, and [we] say, "This would be good. This is how much time we have do you know of any neat activities?" It's like a sharing session and then we sit down and plan out what we need to do.

As November approached, Kevin continued to describe his relationship with Jodi as a collaborative partnership. He began to discuss the fact that Jodi needed more opportunities to teach since his return to the classroom, but he did not describe any concerns. Instead he focused on the collaborative nature of their relationship.

Kevin: *Monday we had to finish up cells by taking a quiz. We gave them time to study in class and then they took the quiz. As soon as they started turning them in, I started grading them. She was walking around the room and monitoring so we could get it all done that day. Again, we shared responsibilities. Yesterday, we gave notes and I pretty much taught all the classes because she was back doing a different task.*

In early November, Kevin began to question the job he was doing as a mentor because he had so many other responsibilities.

Kevin: *I don't know if I'm overwhelmed or what I'm doing, stuff [like the grant proposal and conference application] is just not getting done and I'm not like that. I want to have all my ducks in a row and everything organized and I'm not meeting my expectations. The only thing I feel bad about [with] mentoring-I know she's getting valuable experience, but I think we're doing it more as a collaborative thing instead of me being a true mentor.*

One of the things with people in this program is that [they] know a lot and they know science, but they need the experience in the classroom teaching. I guess [I need to] let go of the reins. I was up there all day yesterday and I shouldn't have been. She's planning the DNA unit now so she'll have many opportunities. We'll probably shift gears [so] she starts to teach more and more.

Though Kevin questioned some aspects of his mentoring, he was confident that Jodi was doing a good job. He even suggested that she was ready to be on her own.

Kevin: *She's pretty much ready as far as I know. She should be teaching. [The PowerPoint presentation she has planned for DNA]-most of it has been better than what I would do. [She's very] thorough.*

Introduction of concerns. While Kevin continued to praise Jodi's work in his class through November, by December he began to express concern because he got the impression Jodi was doing a good job with her organizational skills, but was afraid to be in charge of students.

Kevin: As a mentor, I haven't done very much, but I've tried to show her [what I do] and it's become more of a collaborative thing where we're both working together. [The problem is that the protégés] become too familiar. It's a collaborative thing and not a mentor-[protégé] thing and they don't try to impress anymore. They do what they think they should do instead of [going the extra distance]. I know when I was a student teacher, I always wanted to impress my supervising teacher every chance I got.

[When she taught her unit], she did a good job. She was well organized; she was well prepared. Everything was Xeroxed ahead of time. [But] right now, I'm under the impression that she's scared of the kids. I was out this week [because my son was sick], as soon as she saw that I was out, she didn't show [up]. Monday she came in and I told her I wasn't going to be here. She said, "I've got to leave." Tuesday, I didn't get any word whatsoever and she wasn't here.

Now thinking back to when I was teaching genetics and she said she didn't want to teach it, I should have made her teach. Now that I got up in front [for] genetics, there's a teaching difference [that the kids notice].

Throughout January, Kevin continued to describe the work that he and Jodi did as collaborative, but he still expressed his concern that she was afraid of the students.

Kevin: But I still have that worry that she's afraid of the kids. That hasn't changed. I should have had her teach more first semester, but it just didn't work out. That's why as

soon as we get [through] this evolution, I'm going to say, "You're doing this," and she's taking over.

In late January, Kevin continued to describe the nature of his relationship with Jodi as a collaboration.

Kevin: I think that's where most of my mentoring comes is, "This is how I do it." It's collaboration. In my eyes, it's where we are working towards one goal. Like you saw today, she and I were [both] going around to answer questions. She wasn't comfortable [with] the beginning explanation of speciation so I said, "I have no problem doing it." So I did it and she did the other stuff. We just divide duties in an orderly fashion. She's getting ready to take over. It's just a team partnership, and instead of the kids seeing a student teacher and a teacher, they have pretty much two teachers.

Mounting tension. Kevin and Jodi continued in their collaborative model through most of February, however, by the end of the month, Jodi was teaching a unit made primarily of her own materials. Kevin expressed concern that Jodi was not fully prepared to enact all aspects of her plan.

Kevin: Wednesday [the students did] a fungus lab. We started second period and in the middle of the period, [Jodi] came up and asked me, "Do you know what these are supposed to look like?" [That] was a surprise. That was a problem [because] I felt she wasn't prepared. I tried to take it over, [but] the lab itself was a bad choice. It needed all this prepared stuff and I tried to find examples, but the examples didn't fit with the questions. It was real difficult. We ended up punting and just saying, "We're not doing this." [The students] were still doing stuff, but it wasn't what we planned.

Kevin felt that Jodi was not gaining an appreciation for how all of the aspects of the job of teaching fit together.

Kevin: I was up there teaching and she was supposed to have a whole month of teaching. What I'm seeing is that she could plan that one week on fungi, but then the stuff that goes in between is falling through the cracks. I'm worried she doesn't understand the whole scheme of things. [As a teacher you have to think]-I have to be able to grade papers; I have to be able to plan lab; I have to juggle all those different activities.

Kevin summarized his frustrations about this period in the relationship in the following passage.

Kevin: It's disappointing. I felt she had much higher promise when she first came in. She was doing more the first month she was here than what she does now and it should be totally opposite. It should be building up to a pinnacle and instead we're backsliding. I don't know what to do.

Early in March the pair had a conversation where Kevin addressed his concerns with Jodi. It was at this point that Jodi informed Kevin that she would be reducing the hours of her internship. Jodi had been completing substantially more hours than were required by her certification program and she reduced her schedule to the required 20-25 hours per week. Kevin related his thoughts on this conversation.

Kevin: I said, "That's okay. I understand, but when you're here you're going to be up in front of the classroom."

Resolution and improvement. After Jodi made the decision to reduce her number of internship hours, there was an improvement in the relationship between the two. Kevin felt the lines of communication were re-opened and he regained his confidence in Jodi's abilities as a science teacher.

Kevin: *[The change in schedule has] really made a difference. When we made that switch we had the conversation [where I told her], “When you’re here, you don’t need to just be watching stuff happen. When you’re here, I want you up in front of the classroom.” [After that conversation], she took on a lot more responsibility. Even though she wasn’t here as much, it worked out. She’s always been good at planning and the [activities] that she planned. We sat down with calendars and I helped develop some [things] and she developed some things, but both of us knew what we were doing. It opened lines of communication.*

In an email several months after the internship was over, Kevin shared a summary of his thoughts on their relationship.

Kevin: *The relationship changed in many ways. It finished where it began, but was a roller coaster in the middle. The relationship between Jodi and myself started as a mentor/mentee with me showing her the specifics about the school and what was involved in everyday tasks. We then learned that we teach in different ways and Jodi was not comfortable with my style, but we struggled through it and tried to help each other as much as possible. That was difficult at times because with the birth of my son I was not at work as much as I should have been. Jodi was really wonderful filling in for me when I took leave because of the new baby. She filled in and as far as I know the students didn’t miss a beat, they kept going and we covered the necessary [county science curriculum]. I think when I returned that Jodi felt out of place, or in the way when I was teaching. Looking back I probably should have let her continue in her leadership role in the classroom and guided with my input. Unfortunately that was not what happened, instead I took the teacher role and got back up in front of the students. This caused friction*

between Jodi and myself. Luckily after our winter break Jodi decided only to come the required time which meant three days a week. This changed our relationship dramatically because we set up the teaching schedule so when she was here, she was leading the activities. This set-up worked better and our relationship improved. I was able to give input towards her teaching and she taught me so much about technology in the classroom that I will always be indebted.

Jodi's Perspective

Like Kevin, Jodi's feelings about their relationship were cyclic in nature. While she began the year with an optimistic attitude, she later experienced periods of frustration. By the end of the relationship, however, she was able to look back on her internship experience with positive feelings.

Optimism. As Jodi began her internship, she had positive feelings. She felt comfortable in the environment of Kevin's classroom and worked to establish herself as an authority figure. Jodi mentioned that she got little feedback from Kevin but did not stress that this was a concern.

Jodi: What can I tell you about being here? I really enjoy it. I was really happy the first couple of days that I was comfortable, I didn't have any problems going in [to Kevin's class]. A lot of my strategy has been trying to make sure that I am seen in an authoritative position by the kids. As soon as [Kevin's] lecture is over and they set to their tasks, I go through and help the kids [and] answer [their] questions.

As Jodi described the feedback she had received from Kevin she commented:

Jodi: He doesn't give a lot of feedback. Maybe it's just because he hasn't really found anything he was unhappy with. Cross your fingers, that's all you can hope for. [One day] I asked him, "How do you think I'm doing?" He [said], "You're doing fine. I'm not

worried about you. He's made a couple of comments since then. When we were in the computer lab, [I said], "I think it went fairly well." He said, "Yeah, it went great."

Introduction of concerns. During November, Jodi mentioned collaboration between herself and Kevin, but she did not emphasize that aspect of their relationship the way that Kevin did. Jodi expressed her concerns about implementing someone else's lesson plans during this time period. During November Jodi began to notice the fact that she and Kevin had different teaching styles. Discussing collaboration between the two, Jodi said:

Jodi: *We just look at what we need to do and then we plan which [activities] we are going to do each day. He'll tell me what activities he's got and then I'll look at the pages and we'll decide. But he's pretty much deciding what activities unless I volunteer that I have something. We plan out together what the time frame [is] going to be, but he has his activities he likes to do and we just do those.*

As she discussed her thoughts about implementing plans that changed over the course of the day. Jodi expressed her unease in the following paragraph.

Jodi: *We planned out this lab today [because] he said he had all these anemones at home in his tank. I typed it all up, drew it all up, spent a whole day doing it. He hasn't even used [the handout]. Those are the things that drive me nuts about him- we have this great lab, had it all planned out nice and structured, a good lab [with] specific things for them to look at and then he just gets up there and is all over the place. And then he wanted to turn [the lab] over to me. But I have a hard time taking over because I want to go to what I feel comfortable with which is the lab that I [typed up]. So, if I was going to do it, I would want to do that.*

Once Kevin returned in November after the birth of his son, Jodi commented on the difference between her teaching style and Kevin's.

Jodi: I like a little bit more control in my classroom. He can deal with people being all over the place. I think that there is a time and a place for socializing and group learning, but I probably would have a little more balance as far as traditional learning versus group learning. He does probably put more responsibility on them for their own learning, where I like to keep them more on task. I think that's a personality thing because [I was] the same way in my store [I used to manage] too.

During November, Jodi continued to be concerned by the lack of feedback she received from Kevin.

Jodi: The other week I did a couple of periods and he made one or two comments, but [they] were very small and nothing significant. Hopefully he still feels confident in me, I don't know.

Mounting tensions. While Jodi had been generally positive about her relationship with Kevin, she had shared a few concerns such as differences in teaching style and a lack of feedback from Kevin. These minor annoyances, however, had become troublesome for Jodi. At the end of February, Jodi became extremely unhappy about the relationship. Part of the impetus for the deterioration was the problematic fungi lab.

Jodi: I [said in the beginning] that I thought there might be a problem [with] having a man as a mentor. There's no friendship there. The situation is deteriorating more and more every day. It's sad. I'm just sick of trying to be happy around him all the time. I'm not excited about [being here] anymore. He put way too much on me in the beginning. He hasn't done anything to help. His whole [idea of leading] by example-that is such horse

*****. That's lazy. That's I don't want to help you. That's such a cop out. You just do it yourself and I'll stand here. I can do that on my own and I don't have [him] criticizing me.*

Issues such as minimum feedback and changing lesson plans that had been minor annoyances surfaced as major problems in February after a difficult laboratory experience. Based on this incident, Jodi made the decision to reduce her internship hours to the required minimum of 20-25 hours.

Resolution and improvement. Like Kevin, Jodi felt that this change in schedule led to an improvement in their relationship. The lessening of hours led to more communication and a clarification of expectations.

Jodi: I think it was good for both of us. We're planning on whatever days I am here, I'm teaching.

In the final interview of the study in late April, Jodi continued to comment on the improvement in her relationship with Kevin.

Jodi: It's so much better. First of all, I don't feel like I'm camped out in somebody else's house all the time. I think maybe we just needed a break from each other for awhile. It's been a good working relationship since [I switched] to three days. I think that's a much better deal. Pretty much, I've been running the show on those three days unless he had specific things that he wanted to go over. I've seen a definite change in attitude in him since I haven't been here as much.

[Also], I think going down to three days has made it so I had time to prepare for some of the things I wanted to do instead of feeling like I didn't have time to do anything

and had to do his lessons. It was a good experience overall. I think that anything that happens in your life you can learn things from, and I've learned a lot.

Summary and Preview

Kevin provided Jodi with advice within the domains of general pedagogical knowledge and pedagogical content knowledge. Topics of general pedagogical advice included the timing and closure of lessons. Within the domain of pedagogical content knowledge, Kevin advised Jodi with respect to adjusting the level of material in her presentations to the ability levels of students, using visuals to represent science concepts, and conducting effective laboratory experiences for students.

Both participants felt they gained as a result of their work together. Kevin believed that he learned new uses for technology that he could incorporate into his science teaching. He also felt that he gained new insights into important characteristics that a mentor needed to possess. Jodi shared that she gained new understandings of approaches to science teaching and became more comfortable in the role of science teacher.

Both members of the pair felt various tensions over the course of the internship. The lack of personal connection between himself and Jodi concerned Kevin, as did his perception that Jodi did not spend enough time actually teaching his classes. Kevin expressed some doubts about the job he was doing as a mentor because of personal obligations on his time with the birth of a new child. The lack of communication between the partners dismayed Jodi as well. In addition, she felt tension based on the differences between her own personality and teaching style and Kevin's, and her feelings of being an intruder in someone else's classroom. Jodi's tensions reached a breaking point after a laboratory activity that went awry. The following

chapter details the similarities and differences between the two pairs of participants by examining experiences across the two cases.

CHAPTER 6

CROSS-CASE ANALYSIS

This chapter compares the experiences of the members of the two pairs of participants in the study. It follows a format similar to the previous two chapters in that each of the four research questions is addressed in the following order:

1. What is the nature of the advice and guidance given by the science mentor?
2. What do the mentor and protégé each gain from the relationship?
3. What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them?
4. How does the relationship change over the period of the study?

In this chapter, data from each of the questions will be compared across the two partnerships to highlight the similarities and differences between the experiences of the two pairs. These findings will be tied to literature in the fields of mentoring and alternative teacher certification, as well as the three theoretical frameworks guiding the study: situated learning, border crossing, and teacher development.

Advice Given

There are several domains of expertise acknowledged as important for any teacher. These include: pedagogical knowledge, pedagogical content knowledge, and subject matter knowledge (Borko & Putnam, 1996). As novice teachers proceed in their development in those three areas, the lessons they learn can be influenced by a variety of sources including their own memories as students, teaching experiences in the classroom, and other teachers (Borko &

Putnam, 1996). The following paragraphs explore the role that mentors played in shaping the development of their protégés by highlighting similarities and differences between the advice given by each.

A prominent difference between Melanie and Patti, and Kevin and Jodi was the amount and specificity of the advice provided by the mentor. Based on fieldnote and interview data, Melanie shared a great deal more advice than Kevin. In nearly every observation of Melanie and Patti's planning period, fieldnotes indicated that Melanie instructed Patti on a variety of topics. Examples were prevalent in interviews as well. For Kevin and Jodi, the source of data pertaining to advice was interviews where they were specifically asked about advice that Kevin provided. Advice given by each of the mentors pertaining to general pedagogical knowledge, pedagogical content knowledge, and subject matter knowledge will be highlighted.

General Pedagogical Knowledge

According to Borko and Putnam (1996), the “domain of general pedagogical knowledge encompasses a teacher's knowledge and beliefs about teaching, learning, and learners that transcend particular subject matter domains” (p. 675). These authors indicate that a variety of topics such as classroom management, strategies for conducting lessons and creating effective learning environments, and beliefs about learners and how they learn can be included in this area. Other studies assert that mentors can help novices develop their expertise in such areas as pacing of lessons, acquisition of resources, and techniques for reinforcement (Huling-Austin, 1990; Wang, 2001). Melanie and Kevin assisted their protégés in these areas as well as several others.

Data reveal that Kevin supplied general pedagogical advice pertaining to timing and closure, while Melanie furnished general guidance with preparing for lessons, engaging students,

assessing students, and managing the classroom. Kevin advised Jodi in response to specific questions she asked, but advice giving was not a regular part of their daily interactions as it was with Melanie and Patti.

Melanie did provide Patti with advice relating to timing and closure in addition to other areas previously mentioned, but the advice offered by Melanie was contextualized. Melanie's advice on these topics was given in relation to specific lessons immediately after she observed them, and was intended to prompt reflection on Patti's part. Melanie tried to anticipate what Patti needed to learn to move to the next developmental level and to structure their conversations to help Patti reach those new levels. One example of this type of interaction occurred as the pair discussed Patti's ability to engage students in her lessons. Using numerical data, Melanie pointed out the number of students who were not actively participating in a particular lesson. Melanie told Patti that she thought that part of the problem was Patti's heavy reliance on the overhead projector to deliver several pages of notes. Melanie suggested the use of group work and graphic organizers as a means to convey that type of information in the future. Melanie shared a graphic organizer book she had received at a professional development meeting, and encouraged Patti to choose organizers from this resource in her own planning and teaching.

In contrast to the almost daily direction given by Melanie, Kevin's advice was often in response to Jodi's questions or given when he felt he should give advice because of the researcher's presence. Kevin's advice to Jodi, as in the case with his recommendations about lesson closure, was based on techniques incorporated into his own teaching and provided an opportunity for him to guide Jodi by comparing strengths of his own classroom practice with areas where she had not developed expertise. One explanation for this lack of voluntary advice on Kevin's part could have been his initial perception that Jodi was extremely competent and

capable in her role as a science teacher intern in his class. It is interesting to note that classroom management was one of the topics noticeably absent from conversations between Kevin and Jodi. Strategies for effective classroom management is often a significant concern for new teachers, however, management did not seem to be a major concern for Jodi and was not discussed in interviews or observations.

Pedagogical Content Knowledge

A second category of advice given by Melanie and Kevin centered on the pedagogical content knowledge of their protégés. For the purposes of this discussion, the construct of pedagogical content knowledge is based on Shulman's definition which states that pedagogical content knowledge includes "the ways of representing and formulating the subject that makes it comprehensible to others;" this knowledge is based on "an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different ages and backgrounds bring with them" (1986, p. 9). While new teachers may have an in-depth understanding of the content they are trying to teach, they often do not have the knowledge of students and knowledge of pedagogy to translate that content knowledge into a form appropriate to support student understanding (Gold, 1996; L. Shulman, 1986).

As with general pedagogical knowledge, Kevin addressed fewer topics with his protégé than did Melanie. Areas he did cover included the level of material, the use of visuals, and managing laboratories. While Melanie and Patti conversed about these points, they did so within the broader framework of discussions of planning and presenting science concepts, fostering students' science understanding, and conducting laboratory experiences. Unlike Kevin and Jodi, Melanie and Patti had frequent and detailed conversations around Patti's lesson plans before she implemented them. During these dialogues, Melanie tried to help Patti anticipate potential areas

of difficulty for Patti and the students. She attempted to coach Patti to design lessons that were engaging and meaningful for students, as well as to develop means of assessment that would allow Patti to gauge student understanding in order to plan subsequent lessons. Melanie often observed Patti's teaching and took detailed notes during the lessons. These notes provided a springboard for the pair to discuss the effectiveness of Patti's lessons. Kevin indicated in his interviews that student engagement and covering the state-mandated curriculum were important goals for students in his classes whether he or Jodi were primarily responsible for the lessons. He did not, however, engage with Jodi in the type of regular, in-depth discussions pertaining to planning and teaching observed in Melanie and Patti's relationship. Perhaps this absence of detailed advice giving was due to his philosophy of mentoring based on a modeling relationship. Kevin repeatedly stressed that he expected Jodi to learn by watching him teach and by participating collaboratively in the planning and implementation of lessons. The following paragraphs explore more specifically the interactions of both pair related to the development of the pedagogical content knowledge of the protégé.

Though there was a distinct difference in the amount of advice provided by the two mentors, there were areas where both mentors advised on the same topics including judging the level of material appropriate to the students in the class, using visuals to enhance student understanding, and conducting laboratory experiences. Both protégés expressed feelings of uncertainty about gearing instruction appropriately to the students' ability level. They were unsure as to which content was most important and what level of detail was appropriate. Questions relating to these topics of matching content to student ability level and choosing the most important material to include have been found to be issues for other alternatively certified science teachers (Upson, Koballa, & Nichols, 2003). Kevin and Melanie had conversations with

protégés where this topic was explicitly addressed. Both mentors gave advice about content to include and omit based on their knowledge of the state curriculum and knowledge of the students.

Both mentors felt strongly that visual representations of science concepts were important for students and encouraged their protégés to include those as crucial aspects of their pedagogy. In the case of Kevin and Jodi, Kevin's help with including 2-dimensional and 3-dimensional models of DNA was the most prominent example. For Melanie and Patti, the emphasis on visuals was one component of Melanie's philosophy to present material in as many ways as possible to meet the needs of diverse types of learners. One example related specifically to the incorporation of visuals occurred during a lesson on the evidences for evolution. Melanie encouraged Patti to use the Internet to find pictures of fossils to include in her teaching. Melanie felt the pictures would pique student interest in organisms that are now extinct, as well as help students understand how fossils provide one form of evidence that evolution has occurred.

In laboratory situations, the mentors advised protégés on the importance of thorough preparation and management of the laboratory environment to minimize student behavior problems. In several instances, Melanie and Patti read through laboratory directions step-by-step. Melanie pointed out potential areas for problems and helped Patti formulate instructions that would clarify student confusion. Kevin and Jodi had discussions during which they estimated how long certain laboratory exercises would take and developed plans to ensure the whole class period would be filled in order to minimize student misbehavior. In addition to traditional types of labs, both mentors addressed the topic of activities they considered inquiry labs with their protégés. The protégés helped to facilitate the preparation for and implementation of these inquiry-type labs. As the mentors formulated the plan and prepared to enact it, they

provided a rationale to their protégés for the inclusion of the lab and suggestions to encourage student success and minimize student frustration. Mentors used discussions about laboratory activities to provide several types of advice to their protégés.

The situated nature of these relationships played a critical role in the guidance given by the mentors. Advice given by mentors, and questions asked by protégés were uniquely dependent on occurrences in the classrooms of each of the mentor teachers and the developmental level of the protégé (Silva & Tom, 2001). In the case of both pairs, classroom situations in which Jodi and Patti were the teachers provided the springboard for meaningful conversations about science teaching practice with the help of a more experienced mentor.

Subject Matter Knowledge

The third knowledge domain necessary for teachers is that of the subject they are to teach. Borko and Putnam state that “teachers need to understand not only the facts, procedures, and concepts they teach, but also something about how these ideas are related to other ideas in the discipline” (1996, p. 685). Both of these protégés sought certification in biology. In contrast to the variety and amount of advice given in the areas of general pedagogical knowledge and pedagogical content knowledge, little advice giving was observed or discussed around the topic of subject matter knowledge. Melanie was the only exception to this trend. She had conversations with Patti where she explicitly discussed concepts and examples that should be included in the lesson. The discussion between Melanie and Patti related to a skit that used tag team wrestlers to model the stages of mitosis. In the discussion prior to the activity, Melanie told Patti topics such as haploid and diploid that needed to be included in the discussion, and other words such as centromeres that could be omitted. In discussions related to symbiotic

relationships, Melanie shared specific examples of mutualism and commensalisms that could be used.

While Kevin did not discuss a perception of inadequacy in Jodi's content knowledge, Melanie saw this as a major problem. Patti's lack of proficiency in chemistry knowledge led to the decision that she would not take over Melanie's chemistry classes. Melanie explained that she spent a great deal of time in the beginning of the internship helping Patti with her content knowledge. She felt that the time Patti had to spend outside of class familiarizing herself with the content detracted from the time available to plan lessons. Melanie worried that when she told Patti to prepare for certain lessons, Patti took that to mean learning the content rather than focusing on student understanding. In an email after the internship had ended, Melanie stated that she had spent a great deal of time teaching the content to Patti. By the end of the internship Melanie had indicated to Patti that that was not an appropriate use of their time together and Patti had asked fewer questions about issues of content where her own knowledge was lacking.

Summary

It seems that for new science teachers in this alternative program, mentors were able to help them as they struggled to develop lessons that were appropriate to the students' ability level as well as engaging for them. Members of each pair were able to use the expertise and experience of the mentor to guide the pedagogy of the protégé in ways that encouraged presentation of the content using representations that helped students understand difficult science concepts. Because of the depth of the repertoire of teaching strategies and knowledge of students brought to the relationship by the mentors, the novices were able to engage in conversations with their mentors that allowed them to draw on that knowledge as they planned and executed their own lessons.

Mentors were able to provide advice and suggestions that assisted the growth of both general pedagogical knowledge and pedagogical content knowledge. Development of these domains of knowledge specific to science teachers was one aspect of the border crossing from previous careers to science teacher for these protégés. Melanie especially, advised Patti about many areas of general pedagogical knowledge such as engaging, assessing, and managing students. She worked with Patti on her individual lessons to help her design activities that were pedagogically effective and subject matter accurate for the students in Melanie's classes. After the plans had been enacted, the two had extensive discussions pertaining to the lessons' effectiveness and how they could be modified for further improvement. Kevin chose to use his own teaching as an example for Jodi to model as she developed her competence in these areas. For this pair, Jodi's subject matter knowledge did not seem to arise as an issue. Kevin felt confident in Jodi's knowledge of the content. By the end of the internship, he shared that he was confident in her grasp of pedagogical and pedagogical content knowledge so that she would be able to teach in her own class after the internship.

Gains as a Result of the Relationship

The second question addressed in the study was: What do the mentor and protégé each gain from the mentoring relationship? The two cases will be compared from the perspectives of the protégés, followed by a comparison from the viewpoint of the mentors. Both mentors and protégés gained from the relationship in differing ways.

Protégés

Several studies indicate the importance of the influence of prior experience in shaping novice teachers' views of science teaching (Borko & Putnam, 1996; Feiman-Nemser & Remillard, 1996; Grossman, 1989; Lortie, 1975). Patti and Jodi entered their internship with

well-formulated ideas about the role of a science teacher. For both protégés, their experiences with their mentors led them to expand or modify these views. A second area of growth for the protégés was in their perceptions of themselves as teachers. As any new teacher crosses the border from previous experiences as a student or a professional into the culture of schools, they must take on a new role as a teacher. This requires developing one's own teacher identity (Lave & Wenger, 1991). During the internship, the protégés began to adopt their new identity as teachers with the assistance of their mentors.

For both protégés, one of the results of their internship experience was an expanded view of science teaching. Patti used her own experiences as a student in high school and college classes to influence her understanding of what it meant to be a science teacher. These experiences led her to develop a “teaching-as-telling” orientation. Patti shared that her experiences working with Melanie led her to expand this view and place more focus on using a variety of methods in an effort to meet the learning needs of all students. Patti explained that she did not remember her own teachers caring for the students as much as Melanie did and making such an effort to help them learn. Patti used Melanie's beliefs about these topics as a model for her own evolving understanding.

Jodi was placed with a mentor who had a teaching style that was very different from her own. Though she felt that she would develop her own style once in her own classroom, she explained that her time in Kevin's class had influenced her to see the importance of having students “do” science and have opportunities to work together in some cases. She expressed that she would use a balance of individual and group learning activities in her own class, but had come to value opportunities provided by group learning.

In addition to their evolving understanding of the role of a science teacher, both protégés shared a second benefit of their experience working with a mentor teacher. Jodi and Patti felt that participating in the internship helped them become more comfortable in the teacher role. The two were initially nervous about being in front of the class, but indicated that their comfort level increased as the internship progressed. Patti described her increasing level of comfort in facilitating class discussions and managing the learning environment. In the beginning of the internship, Patti was so nervous that she wrote detailed scripts of her lessons. By the end of the internship, this tactic was no longer necessary. Patti felt that she learned new strategies and resources from her work with Melanie. She was excited about starting a job in a classroom of her own in the following fall.

Jodi shared that she was uncertain and nervous at first about interactions with students. Though she enjoyed the company of youngsters in her neighborhood, she had no children of her own. By the end of the internship, she felt that she had developed a rapport with students while maintaining a professional relationship. She used her reactions to Kevin's interactions with students to shape her own beliefs about student-teacher relationships. By the end of the internship, Jodi was comfortable in her role as a teacher of Kevin's classes.

One of the key tenets of situated cognition is the idea that learning is a social process that is linked to and dependent upon the context where it occurs (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Rogoff, 1990). In the case of these protégés, the social context of the situation in which they were learning to teach with the guidance of their mentor teachers heavily influenced what they learned from the experience. The "situatedness" of these internships led these two interns to develop a revised view of what it meant to teach science. Rather than just hearing about what science teaching should be, they had models within the context of a

classroom situation. Their day-to-day interactions with their mentors, and observations and experiences with students allowed them to inspect their previous understandings and modify them in light of their new experiences. Another important underpinning for situated learning is the idea of legitimate peripheral participation—the notion that newcomers to a community move from peripheral to full participation in the community and develop a new identity as a member of the community with the help of a trusted guide (Lave & Wenger, 1991; Rogoff, 1990). Jodi and Patti revealed their initial nervousness about teaching their mentors' classes. By the end of the experience, however, both described their internships as meaningful learning experiences and both left feeling confident in their ability to be responsible for their own classrooms. Their interactions with mentors helped them cross the border from intern to novice teacher.

Mentors

As mentors engage in work with protégés, they sometimes find that the experience serves as a catalyst for reflection on their own teaching (Feiman-Nemser, 2001). Engagement with protégés encourages mentors to think about and explicate their own decisions. Mentors may also gain from the fresh ideas and insight that protégés bring to the classroom (Feiman-Nemser, 2001). In the case of these mentors, not only did the experience serve as an opportunity to reflect on their own teaching, but it also prompted them to reflect on their own understandings of mentoring.

In Kevin's case, he believed that he developed some understandings that he would take with him into his next mentoring relationship. Kevin felt that he had learned about the importance of flexibility and willingness to let the protégés take charge in the classroom. He indicated that he understood that as a mentor it was vitally important that he be clear about his expectations. Kevin believed he had gained from Jodi through a growth in his own use of

technology in new ways to support his students' learning. Kevin learned about maintaining a class website, developing web quests, and the use of multimedia formats during lecture situations from his interactions with Jodi. He planned to incorporate these techniques in his own teaching even after she was gone.

Melanie did not have the same feelings of growth in her own teaching repertoire as a result of her work with Patti, however, she did discuss her ideas about her own evolving understandings of mentoring. As the internship drew to a close, Melanie reflected on the overall experience. She felt she had come to see the important influence that differing teaching approaches could have on a mentoring partnership. While Patti said that she had adopted a view of science teaching similar to Melanie's, Melanie did not feel this was the case. Melanie believed that many of the tensions in the relationship stemmed from these differing philosophies. Unlike Kevin, Melanie did not feel she had gained knowledge from her experience with Patti that she could use to improve her own teaching. This lack of professional growth in relation to the time and effort she invested in the mentoring relationship was a frustration for her.

It is interesting to note that both mentors seemed to reflect on their experiences as mentors and what they had learned from the experience that could be applied to their work with future protégés. Kevin indicated that he had learned valuable lessons about communication and setting clear expectations. He understood that flexibility and a willingness to relinquish control were important characteristics for a mentor. Melanie believed that a more thorough understanding of the importance of teaching philosophies on mentoring relationships would encourage her to examine this topic more closely with future protégés. Each of these mentors expressed interest in having protégés in the future, and planned to use their experiences with Jodi and Patti to inform those relationships.

Tensions

The third research question asked: What are the tensions that arise in the relationship between a mentor and protégé, and how does the pair negotiate them? In the following sections, similarities and differences between the experiences of the pairs will be compared from the perspectives of the protégés, and the perspective of the mentors. Themes present in both cases included: the disconnect between expectations and the reality for both mentors and protégés, the importance of teaching philosophies in mentoring relationships, and the deleterious effects of a lack of communication.

Protégés

Expectations versus reality. For both protégés there were tensions relating to the differences between expectations and realities. Novice teachers bring many long-held images of teachers and students that can exert a strong influence on their experience once they enter the classroom (Cole & Knowles, 1993; McIntyre et al., 1996). The disconnect in Patti's case arose from her own expectations about what school and the job of a teacher would entail. Patti suffered from the "transition shock" experienced by many new teachers as they move into their new role in the classroom (Veenman, 1984). These new teachers may suffer as their conception of what good teaching is conflicts with what they can realistically accomplish in a science classroom (Wang & Odell, 2002). Patti did not anticipate the time and difficulty involved in learning the content in a way that would allow her to organize and present it in a manner that would be engaging for students. Though she grew to understand more thoroughly the complexity of the teaching profession during the internship, the initial shock of the realities provided an initial barrier for her.

Before the internship began, Jodi explained that she tried not to have preconceived notions of what the mentoring relationship would entail so that she would not be disappointed with the reality of it. Jodi chose the internship route, however, so that she would have the opportunity to learn from and practice in the class of an experienced teacher before she was thrust into a teaching situation for which she was not prepared. During certain periods of her internship, Jodi did not receive as much guidance as she felt was necessary to promote her growth as a science teacher. While guidance in planning and implementing lessons is important, research indicates that emotional support is another important area where mentors can offer assistance to protégés (Gold, 1996). Jodi did not feel that she received emotional support and encouragement on a regular basis. Jodi was uncertain of how Kevin felt about her performance in his classroom, and believed she was often left to plan and enact lessons without his input. This disconnect between her expectations for the mentoring relationship, and the relationship as it existed led to mounting frustrations on her part until the pair were able to develop a schedule and a relationship that allowed her to feel confident in her progress.

Approaches to teaching. In the interviews that took place prior to the beginning of the internship, both mentors and protégés were asked to describe their views of science teaching. Each participant described what a science class should look like and what should occur in those classes. Though the protégés had less experience with science teaching, they still brought strongly held views of what it meant to be a science teacher. These initial beliefs had a strong influence on what the novices experienced during their internships (Bryan & Abell, 1999; Richardson, 1996).

As Patti began the internship experience, she had a teacher-centered approach to science pedagogy based on her own experiences as a student. Patti had a somewhat limited view of how

teaching should occur, based on her own inexperience with the work of teachers. She chose the internship for many of the same reasons as Jodi; she did not want to rush into a situation for which she was not prepared. Patti admired Melanie's teaching style and rapport with the students; however, she struggled to develop an approach suited to her own personality. Patti did not want Melanie to feel that Patti was mimicking her, but felt she did not have other role models. Over the course of the internship, Patti felt that she adopted a philosophy that was similar to Melanie's in which the learning and engagement of the students was of most importance. Her experience in Melanie's classroom helped her to develop a vision and philosophy of teaching that was more focused on the understanding of the students, and involved developing and implementing strategies that allowed her to present the content in many ways, and included group activities in order to promote student learning. As a result of her relationship with Melanie and her experience in the classroom, Patti was able to cultivate a vision that was broader in scope than the one she had when she began her work with Melanie. Tensions arose based on Patti's view that she should not just imitate Melanie, but develop her own strategies. Patti spent a great deal of time and energy to find resources and develop engaging lessons. She was disappointed when Melanie did not always embrace and praise the lessons she designed. Patti was sometimes frustrated by what she perceived as the slow pace of her growth as a teacher.

Initially, Jodi did not discuss the difference between Kevin's personality and teaching style and her own. Only over the course of time, did this difference manifest itself as a problem. Jodi expressed her belief that she was a person who liked structure and order in situations in which she was involved. In a classroom setting, she believed that some group work was appropriate; however, she was uncomfortable with the amount of group work that occurred in

Kevin's classes. She explained that she had come to understand the importance of these types of activities in a science class, but would use more of a balance of teacher controlled activities and group work in her own teaching. Jodi's appreciation for structure and order revealed itself in a second tension in her relationship with Kevin. She felt that Kevin had a more "laid back" approach to his work and was comfortable with flexibility in his lesson planning. He liked to "go with the flow" as the day progressed, often improvising and dramatically changing the lesson from class period to class period. In some cases, he asked her to teach from one to several class periods a day after she had watched him initially teach the material. As a novice in the classroom, Jodi was uncomfortable with this level of uncertainty. She liked to know ahead of time which days and lessons she would be teaching and what the plans would be.

Lack of communication. Jodi felt that Kevin was willing to answer any question that she asked, however, he did not volunteer a great deal of advice, especially in advance of lessons that she planned and taught. She came to feel that the two had differing visions of what it meant to be a mentor. She wanted Kevin's help as she planned in order to anticipate problems and have a clear understanding of his expectations for her lessons. She believed that he wanted her to plan and implement the activities on her own, and then offer some commentary once he had watched her teach it. Even this type of commentary was sparse in her opinion, and she questioned his thoughts about her teaching abilities. Jodi's situation relating to confusion about the role of the mentor due to a lack of communication between mentor and protégé is not uncommon in mentoring and field experience literature. Mentors can hold many conceptions about their role which provide a wide range of models for their responsibilities in the job (Odell, 1990). Confusion and difficulty can arise, as in the case of Kevin and Jodi, when these roles are not made clear (Ganser as cited in Gold, 1996; Huling-Austin, 1990; Klug & Salzman, 1991).

Unlike Jodi, Patti did not mention communication as an issue in her relationship with Melanie. The two had frequent conversations about Patti's plans and the lessons that she taught. Patti discussed several difficult conversations the two had where Melanie was extremely direct in her questions to Patti about the job she was doing in Melanie's class and her progress towards self-sufficiency, but lack of communication did not seem to be an issue.

For these protégés, there were several areas where they experienced tensions related to similar themes. Both Jodi and Patti struggled with the discrepancy between what they expected from their internship and the reality of the situation they faced. For Patti this was due to her preconceived notion of what schools and teaching were like. Jodi ended her relationship with her mentor on a positive note, but experienced a period of tension when she felt he was not meeting her needs as a novice teacher. Jodi and Patti each wrestled with the issue of approaches to teaching, though they experienced this tension in different ways. Jodi felt that her own personality and teaching style differed from her mentor's, and while she could learn from him, she would not completely adopt his approach. Patti admired Melanie's teaching style, but struggled to find a way to enact this style within the context of her own personality. One difference between the two protégés appeared in their feelings about communication with their mentors. Patti had daily feedback and conversation with Melanie about her teaching, while Jodi felt she did not have a great deal of communication from her mentor. The following paragraphs address a comparison of the tensions from the perspective of the mentors.

Mentors

Expectations versus reality. As with the protégés, a major source of tension for both mentors was the difference between expectations brought to the internship and the realities faced

in the relationship. Melanie and Kevin began the internships with certain expectations for their protégés that were not congruent with their experiences.

Melanie thought that Patti would come into the relationship completely competent in her knowledge of the subject matter for the courses Melanie taught. One assumption of many alternative certification programs is that because participants already possess a degree in a science or science related field that their subject matter knowledge is adequate (Kennedy, 1991). In fact, Patti struggled with both biology and chemistry content. Melanie felt that part of the reason that Patti had such a difficult experience was the large amount of time that it took Patti to become comfortable with the content before she could begin to think about how to present it to students. Melanie indicated that she had to spend a great deal of time teaching the content to Patti. A second tension for Melanie was that she was not able to enact her own beliefs about mentoring in her relationship with Patti. Melanie said in her initial interview that she wanted to help her protégé become “completely competent to be on her own.” Melanie hoped to accomplish this by carrying out non-directive conversations with her protégé during which they discussed Patti’s plans and teaching and both contributed to reflective conversations (Glickman, Gordon, & Ross-Gordon, 1995). In reality, Melanie felt she was forced into a relationship in which she had to be very directive and tell her protégé exactly what to do. Melanie did not feel the two developed a collaborative relationship in which both contributed ideas and learned from each other. These discrepancies between Melanie’s expectations and the reality on this issue were a great source of tension.

Melanie and Kevin had a similar tension related to teaching expectations for their protégés. Both believed that their protégés were not eager to take over primary teaching responsibilities in their classes. Tension arose because the mentors felt that this transition to full

participant took too long to occur. One aspect of situated learning is the concept of legitimate peripheral participation; the idea is that newcomers move from a peripheral role in their new situation into a role that involves full participation in all responsibilities of the community (Lave & Wenger, 1991). Melanie and Kevin sensed hesitation on the part of their protégés to assume the duties of full participant in their new teaching roles. Melanie felt she encouraged Patti to be involved as much as possible and quickly begin teaching some lessons. When Patti did not voluntarily fulfill this request, Melanie set up a concrete schedule dictating when Patti would assume these responsibilities. Kevin and Jodi had a similar issue. Kevin initially set up his relationship as a collaboration with Jodi in which both partners worked together to accomplish all of the tasks of teaching that were required for successful lessons. This approach often involved dividing up required tasks such as grading papers and entering scores in the computer grade book, between the two partners in order to complete them quickly and efficiently. The tension arose when Jodi did not assume more of the primary responsibilities for conducting the classes as quickly as he expected. Kevin began to question her abilities and attributed her lack of willingness to spend time teaching as fear on her part.

Approaches to teaching. Just as the protégés were asked in the first interviews to describe their views of science teaching, so were the mentors. Melanie described the importance of using many different approaches in an effort to reach all learners and providing opportunities for students to be directly involved with science experiences as they learned the subject. Kevin discussed the importance of having students “do” science. For both pairs there were tensions that arose because the views of science teaching held by mentors differed from those held by protégés. Melanie expected that Patti would have a teaching philosophy similar to her own. From Melanie’s perspective, that was not the case. Melanie believed that Patti brought a more

teacher-centered orientation than her own. Melanie felt that Patti made some progress in modifying her teacher-centered philosophy, however, Melanie believed the two never did reach a complete consensus. At the end of the relationship, Melanie thought that much of her frustration stemmed from this mismatch of beliefs. From Melanie's perspective, the differing philosophies led Patti to misinterpret or not carry out the advice that Melanie provided because she was clinging to her old beliefs about teaching. Research by Graham (1997) indicates a similar pattern for one of the mentor-protégé pairs in her study. As was the case with Melanie and Patti, the mentor teacher advocated a more student-centered philosophy of teaching and struggled to help the protégé adopt this view.

Whereas, Jodi did discuss the differences in her own teaching philosophy and Kevin's, he did not emphasize this as an issue. During one interview, Kevin mentioned that he did not think that Jodi liked his teaching style, but he did not repeat this assertion or highlight it as an important source of tension in the relationship.

Lack of communication. An important aspect of situated cognition is the notion of intersubjectivity, or mutual understanding that occurs between people (Rogoff, 1990). With mentors and protégés this mutual understanding can involve sharing a clear agreement about the responsibilities of each partner, or a common vision for what should occur in a science classroom.

Melanie clearly articulated her expectations for Patti and gave frequent advice about planning and feedback once lessons had been taught. The tension arose when Melanie did not feel they were able to develop an approach to science teaching agreed upon by both members of the pair. Melanie felt this disconnect between their views led Patti not to enact the advice or complete the tasks that Melanie had assigned her in the way that Melanie expected. Melanie

shared that she often felt that Patti left for the day with a clear understanding of the recommendations Melanie made for promoting student involvement. However, when Patti returned the next day, her plans were not at all what Melanie expected. For Melanie, this inability to develop a shared understanding was a problem for the duration of the internship.

Communication and the development of intersubjectivity was a major problem for Kevin and Jodi. Both were frustrated by what they perceived as a lack of understanding within their relationship. This lack of communication sometimes led them to different interpretations of the same event, occasionally causing tempers to flare. While they discussed these tensions with the researcher, they did not discuss these thoughts with each other. Communication problems also arose for the pair as they negotiated the roles of each in the classroom. Frequently, they expected the other person in the relationship to take on a certain responsibility and then were surprised when that did not occur. Kevin mentioned one instance in particular where he expected Jodi to construct a chapter test based on the teaching she had done. He was afraid this would not occur and built the test himself; he was frustrated this responsibility he felt should be Jodi's had fallen to him. He felt by not completing this task she was not fulfilling all of the obligations that went with her role as teacher. Kevin and Jodi's lack of intersubjectivity manifested itself in other ways. Both tended to avoid difficult conversations in order to minimize conflict with each other. Avoiding the conversations did not lead to a lessening of tension. Instead, their perceptions of events and expectations were not congruent and they spent time frustrated by the relationship. This pattern of avoidance of difficult topics in conversations about teaching has been documented in the work of Hollingsworth (1989) as well.

In the comparison of the experiences of the two mentors with respect to the tensions that arose, three themes emerged: the differences between expectations and realities and views of

science teaching, and problems associated with communication. Though the specific experiences of the participants were different the themes that emerged for both mentors and protégés was similar.

Change in Relationship During Internship

Comparing the experiences of the pairs with regard to the change in their relationship over time, the most salient feature is the similarity of the pattern of experience for Melanie, Kevin, and Jodi. For all three of these participants, they began the year with a sense of optimism about the prospects for the internship experience. During the fall, each expressed some initial concerns but remained confident that the relationship would be a successful learning experience. By spring, concerns mounted from a minor annoyance to a crisis point. The resolution for the two groups was different. In the case of Kevin and Jodi, a change in Jodi's schedule opened up the lines of communication and led to an improvement in their relationship. Both members of the partnership ended the year on a positive note. In the case of Melanie once her relationship with Patti reached a crisis point, she requested the assistance of the university supervisor. When the supervisor seemed accepting of Patti's performance, Melanie resigned herself to that decision and decided to do everything within her abilities to help Patti, but without ever gaining confidence that Patti would be able to succeed on her own as a classroom teacher. Patti's view was different than all three of the other participants. She never expressed that she experienced the level of tension that they did. Patti felt she gradually became more comfortable in the internship and continually improved in her knowledge of teaching and performance in the classroom.

Summary and Preview

This chapter focused on the similarities and differences in experience for the two pairs of participants with respect to the four research questions. Highlights include the differences in the amount of advice provided by the two mentors and the topics of that advice. All four of the participants felt that had gained something from the experience of working in mentoring partnerships, for both protégés this included a revision of their views of science teaching and growth in their comfort level with their teacher identities. Both mentors felt that had gained further insights into their understandings of mentoring that they would apply in subsequent relationships. Though the tensions of each of the four participants were unique, for both mentors and protégés three themes emerged with respect to the data. Tensions arose with respect to expectations versus realities, differing views of science teaching, and problems with communication. Chapter seven provides a review of the study findings, an explanation of the contributions to the literature, and discussion of the findings with respect to implications for research and practice.

CHAPTER 7

CONCLUSIONS AND IMPLICATIONS

The purpose of this study was to examine the relationships between mentors and protégés within the context of an alternative certification program. Research focused on how the relationship between the mentor and protégé developed over the course of the internship and the type of learning about teaching that occurred in the interactions between participants.

Specifically, the research questions that guided this study were:

- 1) What is the nature of the advice and guidance given by a science teacher mentor?
- 2) What do the mentor and protégé each gain from the relationship?
- 3) What are the tensions that arise in the relationship and how do the mentor and protégé negotiate them?
- 4) How does the relationship change over the period of the study?

I used interviews and observations conducted over the course of one school year with two mentor-protégé pairs participating in the internship component of an alternative certification program to inform the study. Using the analytical processes of narrative analysis and analysis of narratives, I converted these data into themes and stories to capture the experiences of the participants in relation to the four research questions (Polkinghorne, 1995). The findings for each pair formed a case highlighting their relationships. A cross-case analysis including a comparison of the experiences of the two mentor-protégé pairs followed. Subsequent sections of this chapter review the findings of the study. The chapter concludes with a description of the

contributions of the study to the literature, and the implications for practice and research based on study findings.

Summary of the Findings

Melanie and Patti. The first research question related to the type of advice given by the mentor to the protégé. Melanie gave Patti advice that was general pedagogical advice, it could have been given by any mentor to any novice teacher, the guidance was not content specific in nature (Borko & Putnam, 1996; Shulman, 1987). Topics related to general pedagogy included preparing for lessons, engaging students, assessing students, and managing the classroom.

Thorough preparation for lessons was one subject addressed. Melanie wanted Patti to understand the importance of having all materials at hand, and ready to use. Melanie requested that lesson plans be prepared well in advance so the two could discuss them, and Melanie could make suggestions to improve the plans. As Melanie provided input, she focused on helping Patti develop strategies that would foster student success and on techniques to enable her to feel successful as a teacher. These conversations covered how Patti could use a variety of instructional strategies to reach all types of learners, and how consistently assessing student progress would enable Patti to structure her lessons to address the students' understanding of the material. Like many novice teachers, Patti struggled with issues of classroom management (Veenman, 1984). Melanie stressed the link between effective lesson planning and classroom management; she also shared specific tips such as the use of teacher movement and parent phone calls as part of a range of management techniques.

In addition to the general pedagogical direction that Melanie shared, she also gave advice that was unique to the science teaching contexts. This advice related to the development of Patti's pedagogical content knowledge. It focused on including appropriate science content,

reflecting on lessons taught, fostering student understanding of specific science concepts, and conducting laboratory experiences.

Melanie had frequent conversations with Patti where she addressed the science content that should be included in lessons. Using her knowledge of the students and county curriculum guidelines, Melanie directed Patti on this topic. After Patti taught in Melanie's class, the two frequently had detailed conversations about the effectiveness of the lessons. Melanie suggested changes that Patti could make in future teaching to enhance the experience for students. For Melanie, it was important that Patti know that preparation meant more than learning the content so that she could understand it, rather it meant knowing the content in way that would allow her anticipate student difficulties or misconceptions about particular science content and structure her lessons to address those potential problems. This preparation included having back-up explanations, analogies, or activities ready if it was clear that students were confused by Patti's first attempt at presenting a specific concept. The final area where Melanie made recommendations to Patti was the topic of using laboratories in the science classroom. Melanie suggested having students be responsible to the greatest degree possible for their own activities in that context.

The second research question addressed in the study was the gains that each member of the pair made as a result of the experience. Here, the perspectives of these two participants varied greatly. Melanie was deeply troubled by what she saw as a lack of progress on Patti's part. Patti, however, felt that she had expanded her view of science teaching and made strides in her development of a science teacher identity.

The topic of the tensions experienced by both members of the pair yielded rich data. Two issues that Melanie and Patti resolved were the inconsistency of Patti's original internship

schedule, and Patti's scripting of her lessons. The pair compromised on a different schedule for the spring semester, and Patti overcame her reliance on word-for-word notes during class lectures. However, Melanie expressed many tensions related to Patti's performance in the internship that were never settled. A major concern for Melanie was her perception that Patti was insecure and unable to develop a level of independence that would allow her to successfully function in her own classroom. Melanie expressed these concerns early in the relationship, and never felt that Patti overcame them. Melanie worried about other aspects of Patti's development in the skills and knowledge needed to be a science teacher. Melanie found Patti's knowledge of science content was insufficient and that her views of science teaching did not mesh with the current realities of schools and students. Melanie expressed anxiety with Patti's ability to manage a classroom environment and develop lessons that would engage students. While Melanie believed Patti had made some small gains as a result of her internship, she did not feel that Patti could successfully navigate her own classroom and teaching situation.

Patti's concerns were different than Melanie's. Patti's initial experiences in Melanie's class provided many opportunities for surprise. Patti based her understandings of teaching on her own days as a student, she described her experience as the "lecture-lab-test" model. The emphasis on the role of the teacher in developing lessons specifically focused on student engagement and understanding was new for her and while she valued her new understandings of teaching, the preparation required more work than she anticipated. Though she felt she made progress over the course of the internship, the growth was not as rapid as she had hoped and she struggled to find her own style rather than just imitating that of her mentor. In addition to these tensions, Patti expressed two others that were similar to those of many new teachers as she wrestled with issues of classroom management and science content knowledge.

The final research question addressed was the change in the relationship between participants over the course of the internship. Here again, the perception of the two participants differed. Melanie experienced a distinct cycle in her relationship with Patti. She expressed optimism at the beginning of the year as she anticipated her work with Patti, followed by mounting concern, and then frustration with what she saw as Patti's lack of progress. Her feelings of repeating the same conversations with Patti dismayed her. In the end, Melanie resigned herself to making the contributions to Patti's progress she thought were feasible, while never feeling comfortable that Patti was completely capable. Patti believed that she made steady progress through the year and became more comfortable with the students and the role of science teacher.

Kevin and Jodi. Kevin's advice to Jodi fell into the same two domains as Melanie's to Patti; these included general pedagogical knowledge and pedagogical content knowledge but the topics within the domain were different. Within the domain of general pedagogical knowledge, Kevin advised Jodi to use some form of closure to summarize the most important points of each lesson with the students. He also assisted Jodi as she tried to determine how long particular activities would take so that she could prepare an adequate amount of instruction for each class period. Within the domain of pedagogical content knowledge, the pair discussed the level of material, use of visuals, and inclusion of laboratories. As Jodi prepared to teach certain topics in Kevin's class, she had questions pertaining to the appropriate level of detail to include in her lessons. She was not sure of the necessary level of depth to include to meet the learning needs of ninth graders. As she asked questions about various lessons, Kevin used his knowledge of students and experience in the classroom to guide her. A second topic of advice for this pair was the use of visuals to help students develop an understanding of particular science concepts. Jodi

used a wide variety of visual materials in her lessons in the form of pictures and short movies from the Internet. Kevin supplemented these resources with visuals and models from his own resources to increase student understanding. The third area related specifically to science teaching where Kevin provided advice to Jodi was the incorporation of laboratories into instruction. He provided instruction to Jodi on the preparation and management of these learning opportunities.

Both Kevin and Jodi felt they had gained knowledge as a result of their work together. Kevin described the different uses of technology he became aware of as a result of his relationship with Jodi. In addition, he discussed his continually revised understandings of mentoring. Kevin indicated that he had become more cognizant of the importance of clear communication and discussion of expectations between mentor and protégé as well, as the necessity for the mentor to be willing to relinquish control of the class to the protégé. Jodi felt that she had come to appreciate the usefulness of group learning and having students actively engaged in science activities.

Moving to the third question, Kevin and Jodi had their own sets of tensions associated with their relationship. For Kevin, the lack of personal connection and communication he developed in his relationship with Jodi was a tension. A second major area of concern was his belief that Jodi did not spend enough time in a position of responsibility for teaching the classes. He felt she was completely capable in many of the responsibilities associated with teaching, however, he felt she was reluctant to spend time actually in front of the class teaching. Like Kevin, the lack of communication in the relationship troubled Jodi. She felt additional stress based on the fact that she was spending so much time in someone else's classroom. Based on her work history as a store manager, Jodi was reluctant to give the impression that she was trying

to take over. Her perception that she and Kevin had different personality and teaching styles became yet another dilemma for her. His more relaxed approach and familiarity with students sometimes made her uncomfortable. In the spring semester, she was dismayed by what appeared to be apathy on Kevin's part. Her tensions in the relationship reached a crisis point during the spring semester after a problematic laboratory activity. Her feelings after that incident resulted in a change to her schedule and a reduction of her hours at the internship site.

As Kevin and Jodi each described the changes in their relationship over the course of the year, they both described a similar pattern. Initially they were optimistic and pleased with their relationship. As time passed, each began to express small concerns that they saw as minor problems. During the spring semester the tensions in their relationships mounted. The change in Jodi's schedule led to an opening of the lines of communication between the two and both ended the experience with positive feelings.

Cross-case analysis. The most notable distinction between the two pairs with respect to advice was the amount given by each mentor. Melanie and Patti carried out nearly daily conversations about Patti's planning and teaching, while Kevin and Jodi addressed certain topics based on the questions that Jodi asked. For both pairs, advice fell primarily in the domains of general pedagogical knowledge and pedagogical content knowledge with both mentors addressing using laboratory instruction in science classes, incorporating visuals to support student understanding, and gearing instruction to the student's level of understanding.

Analysis of the tensions that arose in each pair resulted in the development of three themes for both mentors and protégés related to their interactions. These themes related to differing views of science teaching between mentors and protégés, the disconnection that occurred as realities did not meet expectations, and problems that developed due to issues with

communication. Kevin and Jodi resolved some of their tensions and ended their relationship on a positive note. Through the end of the internship, Melanie continued to discuss the same concerns that had been present throughout. Patti was pleased with her progress in the internship.

Kevin, Melanie, and Jodi all experienced a similar cycle of feelings over the course of the internship beginning with optimism followed by a period of mounting concerns. Kevin and Jodi were able to resolve many of their concerns and return to a feeling of satisfaction with the relationship. Melanie, however, resigned herself to completing the internship without Patti reaching the developmental level that Melanie had hoped. Patti was pleased with her progress and felt she learned much from the experience as she grew in her understandings of science teaching.

Contributions to the Literature

This study contributes to the literature in several areas. The study informs the literature in science education and alternative certification relating to the role of the mentor in facilitating the development of pedagogical content knowledge. The study provides new understandings in the mentoring literature with respect to the important influence that tensions can have in the effectiveness of these relationships, as well as the important influence that teaching philosophies and communication can exert on the tensions that arise in the relationships.

Mentoring in science education. A major part of the rationale for conducting this study was the paucity of research addressing science specific mentoring relationships. One significant contribution of this study is the detailed exploration of the advice given by these mentors to their protégés with respect to the development of pedagogical content knowledge in science. Mentors provided their protégés with specific advice about what content to include in their lessons as well as how to present that content. In the case of Melanie and Patti, this advice contained discussion

of areas of student misconceptions with thoughts about how to avoid them. Though few of the laboratories described would be categorized as inquiry-oriented, both mentors did address the topic with their protégé and provide encouragement to include inquiry labs in a science curriculum. Both mentors conducted at least one laboratory activity that they defined as an inquiry-oriented lab and included techniques to encourage success on the part of the students.

Mentoring in alternative certification programs. Alternative certification programs tend to rely heavily on field experiences and strong mentoring programs (Chapelle & Eubanks, 2001; Chesley et al., 1997; Feistritzer, 1993). One finding of this study is that just as with other novice teachers, these interns in an alternative certification program relied on their own experiences as students to formulate their views of teaching. These interns entered the internship with a view that was teacher-focused and heavily reliant on presenting content knowledge. The mentors adopted the important role of modeling a different view of science teaching that focused on student engagement and understanding through the use of science activities and multiple representations of difficult concepts. This finding contradicts literature which questions the benefits of mentoring relationships due to the danger of perpetuating traditional views of teacher-centered instruction (Ballantyne et al., 1995; Evertson & Smithey, 2000, Gratch, 1998). Like the participants in Graham's (1997) study, this study found that the mentors were the partners in the relationship with the more progressive ideas about teaching.

Influence of the duration of the field placement. Novice teachers reflecting on their teacher preparation indicate that field experiences are the most important source of their learning (Smylie 1989 as cited in Huling-Austin, 1992). A prevalent belief amongst preservice teachers, inservice teachers, and some teacher educators is that more time in the field leads to better preparation and more learning on the part of the interns. In the PACSS program as it existed

during the period of the study, interns were present in the classroom of a mentor teacher for almost one school year. The experiences of Patti and Jodi indicate that more time in the field does not necessarily lead to more learning on the part of the protégé. For both pairs of participants, tensions mounted over the course of the internship, placing constraints on what could be gained through the mentoring relationship. In Jodi's case, she felt she did not get the guidance that she needed to maximize the potential for learning in the internship. For Patti, she felt she benefited from more time in the classroom, however, her mentor teacher still felt her under-prepared for the rigors of classroom life. While extended field placements can be beneficial to new teachers, careful consideration of the nature of that field experience is necessary. Based on the findings of this study, it is recommended that field experiences be structured so that interns can form learning communities with each other, their university instructors, and teachers in local schools through close interactions with multiple teachers over a year-long period.

Understanding of how tensions evolve in mentoring relationships. Much of the literature related to mentoring focuses on the benefits that accrue to mentors and protégés from participating in these relationships. While there can certainly be benefits as a result of mentoring programs, this study highlights another perspective on these relationships – the tensions that can arise. The tensions in the relationships form barriers that limit the learning that occurs for both mentors and protégés. For these pairs, some of the tensions were based on the personal characteristics or content backgrounds of the participants. Others were a result of the actions of the people in the partnerships. One prominent example of this type of barrier occurred in Kevin and Jodi's relationship; their lack of communication led to questions and uncertainties that could have been avoided through open discussion of their thoughts. The importance of communication

was a prevalent factor in another set of tensions that affected all four participants, the differences between their expectations and the realities of their experiences in the relationship. Participants were not aware of the expectations that their partners held for the relationship and therefore were unaware they were not met. For instance, Jodi did not know Kevin's view of the role of a mentor. He saw a mentor-protégé relationship as a collaborative one where the protégé learned by modeling the actions of the mentor and spending time in front of the classroom. Jodi expected more direct guidance and sharing of ideas about lesson planning and discussion of performance. The findings of this study suggest that mentors and protégés make their expectations for the relationship explicit from the beginning.

Considerations of the impact of mentors' and protégés' views of science teaching. Both mentor pairs experienced tensions regarding their different views of teaching. While mentors can exert a beneficial influence in expanding protégés' views of science teaching, the differences can also lead to frustration leading to constraints within the relationship. For example, Melanie felt the difference in views of teaching between herself and Patti led to some of their communication problems. She believed that their different views caused Patti to misinterpret some of the advice she received from Melanie. The misinterpretation led to confusion regarding certain guidelines for preparation Melanie thought she had been clear in setting forth.

Insight into situated learning as a theoretical framework for learning to teach. Literature in the field of situated learning emphasizes the gradual assumption of responsibilities for some task by a novice with guidance from a protégé (Lave & Wenger, 1991, Rogoff, 1990). This study highlights the way that protégés in these apprentice relationships do not simply model their mentor. Each of these protégés brought their own personal experiences with schools and teaching to the relationship which proved to be a mediating factor in what was learned through

the relationship. The protégés did not simply model what they saw. In addition, in Kevin and Jodi's relationship there was not simply a one-way transmission of knowledge about teaching from "master" to "apprentice." Kevin was able to add to his knowledge relating to the use of technology with Jodi as his guide.

Insight into border crossing as a theoretical framework for examining mentor-protégé relationships. In literature that currently exists in science education, "border crossing" has been used as a lens to explore the transitions that students must make as they move from their home experiences and culture into that of school science (Aikenhead, 1998; Phelan et al., 1998). The framework has also been used to examine the transition that novice teachers must make from their previous careers into a new career as a teacher (Upson, et al., 2003; Williamson, 2003). This study highlights the usefulness of "border crossing" as a lens through which to view mentor-protégé relationships. For both pairs of participants in this study, their beliefs about teaching, expectations about their mentoring relationships, and ability to effectively communicate represented barriers that had to be negotiated within the context of learning to teach in these relationships.

Implications for Practice

The findings of this study have already influenced practice in several ways. The experiences of these participants were one factor involved in a decision to restructure the internship component of the PACSS program. They also led program coordinators to rethink their assumptions about content knowledge and change the entry requirements for the program. In addition to changes already implemented, there are other possible contributions for the future. The cases developed as a result of this work can be used with prospective mentors and interns to provide opportunities for discussion related to mentor-protégé relationships in an effort to inform

the perspectives of each about the possible benefits and tensions associated with these partnerships.

Influence of duration of field placement. The experiences of the participants in the study led to a restructuring of the internship component of the PACSS program. Protégés struggled with transition shock and the difficulties associated with spending such a long period of time in someone else's classroom. Mentors experienced confusion relating to expectations for when protégés would take over primary responsibility for their classes. All of the participants except for Patti felt their tensions increase as the internship progressed. For these reasons, the decision was made to redesign the internship. In the new arrangement, protégés complete a 20 hour per week sheltered experience during the first semester of the internship. This sheltered structure allows interns to observe in the classrooms of many different science teachers, at several different schools to help them readjust to school culture and learn from observing other teachers in action. So that the interns get a sense of the variety of situations they may face, their observations are rotated through both middle and high school science classes, as well as the different levels of science classes taught in one school. The interns are encouraged to participate in the classrooms as much as feasibly possible by helping students in laboratory and group-work situations, and to talk with teachers during the planning period about their experiences and decisions in the classroom. Interns meet once a week as a group with the course instructors to discuss their observations and the implications for their own developing approaches to teaching science. Towards the end of the first semester, interns are expected to design and implement a few lessons of their own with the guidance of a more experienced teacher. During the second semester, each intern is placed with one mentor in their subject area to complete the internship. This second semester experience is structured like the experience of Patti and Jodi, except that

the interns are expected to quickly assume teaching responsibilities in the classes of their mentor teachers. The idea behind the restructured internship was to allow PACSS interns who may have been away from school for many years to become familiar with the culture of science classrooms without the shock of being thrown in with primary responsibility for planning and teaching. Interns begin their border crossing from their previous careers into teaching, and from student to teacher by gradual immersion into the role of teacher. Experienced members of the culture guide them during both semesters of the experience. Interns benefit from the experiences of more than one guide as they move into their new roles. The hope is that the restructuring will lessen the confusion for both mentors and protégés as to the role that each should have in the classroom.

Assumptions about content knowledge. One of the frequent assumptions of alternative certification programs is that because of their course work and work experience, participants in these programs bring the content knowledge that they need with them to the certification program (Kennedy, 1991). The role of the certification programs and the mentors within the programs is to help the novice teachers develop the pedagogical and pedagogical content knowledge they need in order to successfully teach students. This study indicates that assumption of subject matter competence is not always accurate. Though there may be other ways to address the issue, coordinators for the PACSS program implemented the requirement of a passing score on the Praxis II content tests as a prerequisite for the program. Though it may not eliminate the problem of participants with weak subject matter knowledge, it does provide a rationale for encouraging prospective alternative certification teacher candidates to refresh or expand subject matter knowledge before entering the classroom to begin their pedagogical training.

Consideration for mentor professional development. Developers of mentor training programs can take several lessons from this study. Before mentors begin their work with

protégés, they need guidance in numerous areas. Included is the necessity for training programs to emphasize the importance of clear communication with respect to expectations and teaching philosophies. Parts of the narratives developed in this work can serve as cases to provide a springboard for discussions between mentors. Within the context of a mentor training program, mentors can read brief passages highlighting the perspectives of mentors and protégés. As a group, they can reflect on possible solutions to problems or areas where mentors can provide support to their protégés. The findings of this research also indicate the necessity for a system of support for mentors once they are engaged in their relationships with protégés.

Consideration for discussion with interns. Mentors are not the only members of the partnership who can benefit from exploring these cases. Interns too need to be aware of possible tensions within a mentor-protégé relationship and how those can be minimized. Awareness of the borders to be crossed can help both mentors and protégés develop strategies to navigate them.

Implications for Research

The findings of this study can serve as a starting point for further research in the field of mentoring in science education. The experiences of Melanie, Patti, Jodi, and Kevin highlight the need for further research to inform the professional development of mentors, how mentoring relationships are established, and how mentors affect the growth of their protégé in the areas of pedagogical knowledge and pedagogical content knowledge, and further exploration of the role of gender in mentoring relationships.

Influence of mentors on professional growth. The first possible area of research focuses on the influence that mentors have on the professional growth and expertise of their protégés. While the experiences of these participants begin to shed some light on the “black box” that is the actual experiences of mentors and protégés working together in a close relationship, the

difficulties encountered, and the discrepancy between the experiences of the pairs outlines the need for further exploration of the interactions that occur between mentors and protégés. Further studies investigating the discourse between mentors and protégés as it occurs is needed to determine what the protégés are being taught by their mentors. These studies should focus specifically on the conversations that occur between mentors and protégés relating to the planning and implementation of lessons over the course of the internship. In addition, this study indicates the need for longitudinal studies of the protégés' experiences. These protégés participated in an internship program and then began to work in classrooms of their own. An exploration of how the knowledge protégés indicate that they gained as a result of their mentoring relationship is enacted once they are on their own would be beneficial.

Development of authentic cases. A second area of needed research has ties to both research and practice. This study illustrates both the difficulties and rewards that can accrue to mentors and protégés based on their relationships with each other. These cases based on the authentic experiences of mentors and protégés can be used as a springboard for discussion in mentor training sessions. They can also be used with prospective interns to inform discussion of situations that may arise during the field component of their teacher education. More cases of this type based on real life events would be useful to expand the repertoire of available material. Once mentors have been identified who exhibit the desirable characteristics of an educative mentor, their practice can be explored and documented in both narrative and video format in order to develop cases that could be used in mentor training programs to model effective mentoring practices.

Influence of university supervisors. A third area of needed research indicated by this study is the need for more in-depth understanding of the role of the university supervisor. In both

of these cases, the supervisor was rarely mentioned and seemed to have little impact on the tensions or successes within the relationships. A large amount of resources are expended to provide the services of these people, and yet their role is little explored or understood.

Mentor training programs. A fourth area of needed research relates to the impact of mentor training programs on the practices of mentor teachers. Both Melanie and Kevin participated in the same mentor training program and yet as they implemented what they learned from the program they used very different strategies and seemed to hold different understandings of their responsibilities as mentors.

Influence of gender on mentor-protégé relationships. Jodi described her strong feelings about the difficulties involved in having a male as a mentor in several instances over the course of the relationship. Her feelings point to the need for the further exploration of the role that gender plays in these relationships.

Summary. While the experiences of Melanie, Patti, Kevin, and Jodi are informative, they highlight the complex nature of these relationships. Because field experiences are such a formative aspect of any new teacher's education, they warrant further study in many areas including longitudinal studies of the experiences of protégés after they leave their mentors' classrooms, development of more cases for use in mentor and protégé training, study of the influence of gender on mentoring relationships, and an exploration of the role of the university supervisor.

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APPENDIX A
PROTOCOL FOR INITIAL INTERVIEW

Questions for Mentors

Think about your vision of excellent science teaching. Describe that for me.

- what teacher is doing
- what the students are doing
- types of activities

I know that you've had lots of experiences with mentoring, think about an experience that you've had and tell me about that.

As you think about your work with your protégé this year, tell me about some of the expectations that you have.

When you think about your work with your protégé this year, tell me about what you see as your role in that relationship

Tell me about your decision to accept this job as a mentor.

- how did you come to that
- reasons that led you to
- benefits that you expect

As you think back in your work with previous protégés, tell me about some aspects of the job that have been difficult

_____ will be your protégé this year, tell me what you see as her role in this relationship

Is there anything else that you would like to share that I haven't asked you about.

Questions for Protégés

1. Tell me about your background in science

2. Situation now-working etc.

3. Think about your vision of excellent science teaching. Describe that for me.

- what teacher is doing
- what the students are doing
- types of activities

4. Think about an experience that you've had with mentoring and tell me about that.

5. As you think about your work with your mentor this year, tell me about some of the expectations that you have.

- hope to gain

6. When you think about your work with your mentor this year, tell me about what you see as your role in that relationship

7. Tell me about your decision to take an internship position rather than a job teaching provisionally .

- how did you come to that

- reasons that led you to

- benefits that you expect

8. As you think about your work with your mentor, tell me about some concerns

- aspects that may be difficult

9. ____ will be your mentor this year, tell me what you see as his role in this relationship

10. Is there anything else that you would like to share that I haven't asked you about.

APPENDIX B
DATA COLLECTION LOG

Kevin and Jodi	Melanie and Patti
<ul style="list-style-type: none"> • 8/28 Interview with Kevin • 8/30 Interview with Jodi • 10/3 Visit with Kevin and Jodi-fieldnotes of 2nd period, interview with each of them. • 10/10 Visit with Kevin and Jodi-fieldnotes of 6th period, interview with each of them [big gap here because of school schedule an Ks wife having baby] • 10/22 Visit with Kevin and Jodi-fieldnotes of 1st period planning and 2nd period class, interview with each • 11/01 Visit with Kevin and Jodi-fieldnotes of 1st period planning and 2nd period class, interview with each • 11/07 Visit with Kevin and Jodi-fieldnotes of 1st period planning and 2nd period class, interview with each • 11/14 Visit with Jodi [Kevin was absent]-fieldnotes of 1st period planning and 2nd period class • 11/18 Visit with Jodi and Kevin-fieldnotes of 1st period planning and 2nd period class, interview with each • 11/25 Visit with Kevin and Jodi-fieldnotes of 5th period, interview with each • 12/3 Visit with Kevin and Jodi-fieldnotes of 2nd period (wanted to see Jodi conduct the lab she had planned this day went just to see that-so there are no interviews) • 12/5 Visit with Kevin and Jodi-fieldnotes of 5th period, interview with each (<i>interviews did not tape</i>) • 12/12 scheduled observation and interview 	<ul style="list-style-type: none"> • 9/5 Interview with Patti • 9/09 Interview with Melanie • 10/21 Visit with Melanie and Patti-fieldnotes of 7th period planning, interview with each of them [gap due to the fact that there was a school holiday on Friday and Monday, two of the days Patti was scheduled to come] • 11/01 Visit with Melanie and Patti-fieldnotes of 7th period planning, interview with each of them [gap here because I couldn't go one week due to scheduling conflicts with Melanie's schedule and my schedule] • 11/11 Visit with Melanie and Patti-fieldnotes of 7th period planning, interview with each • 11/15 Visit with Melanie and Lisa-fieldnotes for 6th period. Audio-recording of planning. [No interviews because it was my second visit that week] • 11/22 Visit with Melanie and Patti fieldnotes for 4th period through after school. Interview with each. (<i>I was there for so long on this visit because I had thought Patti would be teaching the Chemistry classes and I wanted to see that. Didn't get the message from them that plans had changed</i>) • 11/25 Visit with Melanie and Patti during first period. Transcription of planning period. (<i>Patti was teaching her first full lesson this day but so was Jodi, I had already planned to see them in the afternoon. The only solution I could come up with was to watch Patti first period so I would know what happened and leave an extra tape recorder to record what happened during planning.</i>) • 12/6 Visit with Melanie and Patti during

<p>with Jodi and Kevin (<i>neither was present when I went</i>)</p> <ul style="list-style-type: none"> • 12/16 scheduled observation and interview with Jodi and Kevin (<i>neither was present when I went</i>) • 12/19 Interviews with Jodi and Kevin (no observation possible due to exams) • 1/16 Interviews with Jodi and Kevin (no observation because Kevin was teaching his aquaculture unit and Jodi had no input and wasn't teaching) • 1/23 Observation 1st and 2nd, Interview with Jodi, no interview with Kevin because Jodi wasn't comfortable teaching evolution material covered in class that day. • 1/27 Observation 5th, Interview with Kevin and Jodi • No interview for week of 2/3 because Kevin was teaching the unit and Jodi was observing and helping • 02/10 Observation of 5th period. Interviews with Jodi and Kevin • 02/20 Observation 5th period. Interview with Jodi and Kevin 6th and after school. • 03/06 Interview with Kevin. Interview with Jodi • 04/30 Final Interview with Jodi. Final interview with Kevin. 	<p>planning, interview with each of them after school. (<i>Interview with Melanie did not tape</i>)</p> <ul style="list-style-type: none"> • 12/11 Visit with Melanie and Patti 5th period and 7th period observation. Interview with each after school • 12/16 observation of 1st period. (Patti's pea lab) Left tape recorder for them to record 7th period planning • 01/13 Observation of 6th and 7th period. Interview with each after school • 1/21 Observation 6th and 7th. Interview with each after school. • 1/29 Observation 6th and 7th. Interview with each after school. • 02/06 Observation 5th. Interview with Melanie 6th. Interview with Patti 7th. • 02/12 Observation 5th, phone call with university supervisor 6th, planning 7th. Interview with Melanie and Patti. • 02/18 Observation 5th and after school. Interview with Melanie 6th. Interview with Patti 7th. • 02/26 Observation 5th and after school. Interview with Melanie 6th. Interview with Patti after school. • 04/15 Final interview with Melanie. Final interview with Patti.
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APPENDIX C
SAMPLE INTERVIEW PROTOCOLS

Interview protocol for visit to Kevin and Jodi on 11/07/02

Questions for Jodi:

- Tell me about what's been happening this week.
- Ask Jodi how she feels about content, is she comfortable or is she having to learn as she goes along?
- Tell me about his role as a mentor so far.
- Tell me about how her planning for the transcription and translation unit is going
-Kevin's role in that
- When I asked about his role, you talked about the fact that you have to ask if there is something you can do to help. Examples
- Kevin's response to situation with student-getting on table

Questions for Kevin:

- Tell me about week this week
- Tell me about a time that stood out this week as a mentor
- Get Kevin to tell me more about what he means by collaboration and give examples.
- Ask Kevin about his reaction to incident with the girl who gave Jodi a problem when he was absent. How does he handle students who don't listen, did they discuss that?
- Kevin talked about his role as a mentor in the interview on 11/01 as getting out of the way and letting her teach...observing and asking reflective questions, has he actually done that now that he's been back full time this week??
- Kevin comment in the field notes is that he feels like he's been screwing everything up and has been a slug, what does he mean by that? Tell me more about that.
- Now that Kevin is back, how do they transition and decide who does what?

Interview Protocol for Visit to Melanie and Patti on 11/22/03

Questions for Melanie

- TMA what's been happening this week
- L mentioned that they did a lab that she had found on-line about germinating seeds, TMA
-planning
-discussions about it
- In your conference with L last Friday, you told her that you wanted her to jump in and begin to teach more. TMA. Has it happened?
- TMA a typical planning period for you and L
- You are a science teacher-tell me about the lessons that you want her to learn about teaching science
- TMA planning for wrestling lesson

Questions for Patti:

- TMA what's been happening this week

- talked about balancing because there are so many levels in the class, TMA, how does Melanie deal with that
- said you had taken notes on her teaching style, very nurturing, what else stands out to you about it
- mentioned that by watching Melanie you've been trying to pick up ways to communicate with the students and make sure that everybody is getting the material-example, TMMA
- said P takes difficult concepts and presents them in a way that the students can understand, example, TMMA
- mentioned that you plan together TMA
- TMA what you're learning about science teaching
- TMA planning for wrestling lesson

APPENDIX D

SAMPLE PAGE FROM DATA ANALYSIS CHART

One page from the data chart generated based on advice from fieldnotes and interviews with Melanie and Patti. The final chart for this pair for the topic of advice was 65 pages in 10 point font.

<p>Interview with P 01/13/03 P1-2 L 49-59</p>	<p>I know that um, when she was making the pea mixture, she wanted to go ahead and add almost all the ingredients and then give them the mixture and then all they would have to do is add the alcohol and I talked her into um, I mean she still didn't want to do it even though I had set it up that way um, first period but then she said she could kinda see my point by the end of the day. I talked her into just giving them the bare minimal pea mixture and then give all the kids all the ingredients and let them have more time to read about this is a detergent that we're putting in and this is what the detergent does, because if she put everything in on her own and just gave them a mixture and all this other stuff in it, then it's not really. It doesn't really help them understand what all the ingredients do to the cell and why it actually releases the DNA so, um, I did make that suggestion 'cause she was kinda fighting me on it I guess first period, but I told her I said no, you know give them as much as you can.</p>
<p>Interview with P 01/13/03 P2 L 64-72</p>	<p>I suggested that she take some time at the beginning of class or maybe it was at the end, I can't remember to do a review with them about what DNA looks like and the parts of DNA um, because I know first period we just went into the lab and did it and it didn't take a long time to do the lab and then the kids were just kinda waiting back I the room, but it's such a great class that I said I really think you need to make that change for the 5th period to structure it more and get them to you know go over the point of the lab and not just come in here do something fun and then go sit in there for 20 minutes, so. She actually did that um, and it seemed to work fine because she did it at the end of class, that's what it was.</p>
<p>Interview with P 01/13/03 P3-4 L 149-156</p>	<p>when she first started out, some of that she was kind of talking a lot and the lessons were very teacher centered. You know, and they weren't focused on um, ensuring that the students actually were understanding and giving them practice even if it was just asking them probing questions, it was kinda like here's what I know, any questions you know. And um, I really wanted her to figure out some way to ensure that the kids understand what she's doing and she could come up with some way where she talked minimally, maybe twenty minutes a period and left them 20 minutes to practice or do something, model somehow, anything.</p>
<p>Interview with P 01/13/03 P4-5 L 200-205</p>	<p>I've just been watching to see if she-. I'm not trying to tell her what to do but I'll say stuff like you know, I don't think that these kids understood where you were going with that, so you might want to think of a different way to say it so um, I'm trying to just throw her in as much as possible on the Chemistry and then giving her time to do what I would want which is plan and think about it and research on the</p>

	biology because she's made a big point to tell me that she'll only be certified to teach biology.
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<p>Interview with P 01/13/03 P5 L 210-218</p>	<p>I told her you know with this chapter on Chemistry and I'm gonna have you do some demonstrations and some labs and I said I want you to be ready for it so I'm the one that said I want you to go home and be prepared and maybe she kinda got the impression that all she needed to do was study and understand it for herself and I think today, I hope that it made an impression with her when I said that's just the surface job for you, but then to go on and think what kinda questions are they gonna ask me, how can I best explain it to 'em. If I explain it to 'em in this way that I want to explain it to 'em and it doesn't work, what's my back-up explanation. Everything is more important than just understanding it for your self.</p>
<p>Interview with P 01/13/03 P5 L 233-241</p>	<p>I did give her some feedback in the format of how she was doing the demos. I remember specifically several times I, I don't know I think she changed it finally. But she would basically say this is what I'm going to do and this is what is going to happen. Instead of saying, here's my materials, okay watch this. You know. And like letting them go whoa. And then her kinda trying to pull out of them, why do you think that happened. And then letting them you know and that was a big deal to me actually. That was probably the biggest thing that I gave her was having her do the demo and then try to get out of them and not tell them what happened, but try to get them to figure out what happened.</p>

APPENDIX E

SUMMARY OF THEMES FOR EACH PAIR

The following table outlines the findings for each pair for each of the four research questions.

Melanie and Patti	Kevin and Jodi
<p style="text-align: center;">Advice</p> <p>General Pedagogical Knowledge</p> <ol style="list-style-type: none"> 1. Preparing for Lessons 2. Engaging Students 3. Assessing Students 4. Managing the Classroom <p>Pedagogical Content Knowledge</p> <ol style="list-style-type: none"> 1. Including Appropriate Science Content 2. Reflecting on Lessons Taught 3. Fostering Student Understanding of Specific Science Concepts 4. Conducting Laboratory Experiences 	<p style="text-align: center;">Advice</p> <p>General Pedagogical</p> <ol style="list-style-type: none"> 1. Timing 2. Closure <p>B. Pedagogical Content Knowledge</p> <ol style="list-style-type: none"> 1. Level of Material 2. Use of Visuals 3. Conducting Laboratory 4. Amount of Advice
<p style="text-align: center;">Gains as a Result of Relationship</p> <p>A. Patti's Perspective</p> <ol style="list-style-type: none"> 1. Changing Views of Science Teaching 2. Feelings of Progress <p>B. Melanie's Perspective</p> <ol style="list-style-type: none"> 1. No real progress 2. Understandings about Mentoring 	<p style="text-align: center;">Gains as a Result of Relationship</p> <p>A. Kevin's Perspective</p> <ol style="list-style-type: none"> 1. Technology 2. Understandings about Mentoring <p>B. Jodi's Perspective</p> <ol style="list-style-type: none"> 1. Changing Views of Science Teaching

Tensions	Tensions
<p>A. Melanie's Tensions</p> <ol style="list-style-type: none"> 1. Patti's Schedule 2. Patti's Insecurity 3. Scripting Lessons 4. Content Knowledge 5. Preparation for Lessons 6. Managing the Learning Environment 7. Pace of Lessons 8. Independence 9. Patti's Progress 10. Views of Science Teaching <p>B. Patti's Tensions</p> <ol style="list-style-type: none"> 1. Roles and Responsibilities of a Science Teacher 2. Content Knowledge 3. Impressions of Progress 4. Finding her Own Style 5. Classroom Management 	<p>A. Kevin's Tensions</p> <ol style="list-style-type: none"> 1. Personal Connection 2. Communication 3. Kevin's Impressions of his Mentoring 4. Lack of Time in Front of Class 5. Different Teaching Styles <p>B. Jodi's Tensions</p> <ol style="list-style-type: none"> 1. Communication 2. Someone Else's Class 3. Perception of Kevin as a Teacher 4. Time Constraints Due to Amount of Content 5. Different Personalities and Teaching Styles 6. Fungi Lab
<p>Change in Relationship Over Time</p> <p>A. Melanie's Perspective</p> <ol style="list-style-type: none"> 1. Optimism and Excitement 2. Mounting Concern 3. Frustration 4. Resignation <p>B. Patti's Perspective</p> <ol style="list-style-type: none"> 1. Slow, Steady Progress 	<p>Change in Relationship Over Time</p> <p>A. Kevin's Perspective</p> <ol style="list-style-type: none"> 1. Optimism 2. Introduction of Concerns 3. Mounting Tensions 4. Resolution and Improvement <p>B. Jodi's Perspective</p> <ol style="list-style-type: none"> 1. Optimism 2. Introduction of Concerns 3. Mounting Tensions 4. Resolution and Improvement

APPENDIX F

EXAMPLE OF TRANSLATION FROM RAW DATA TO NARRATIVE

Raw Data:

<p>11/25/02 Interview with J P2: L67-71</p>	<p>Second period had a hard time, but thankfully, Kevin ran in there and grabbed out the model and I think that helped too you know. People see a flat thing on the screen, but seeing a 3D thing can sometimes help, or actually putting the ladder together sometimes helps. So, that was really great that he had that for third period.</p>	<p>Use of visuals</p>
<p>11/25/02 Interview with J P3: L 108-110</p>	<p>I think that's pretty much. You know, it needed those extra prop things, but other than that you know, he said it, he didn't say anything else.</p>	<p>Use of Visuals</p>
<p>12/19/02 Interview with J P1 L 31-39</p>	<p>Kevin was really good about um, you know, when I got to the point where if I was showing a slide and trying to explain it to them and even though they had graphics up there, still saw a few blank looks out there you know. And some questions being asked um, that I was trying to clarify and so he ran and grabbed a model, you know a 3D model to show the students, which was really helpful because-but you see those kind of things, I wouldn't have to do that. So, that was really good. But he did, he really watched out and stood there and a couple of times when the kids looked like they were having trouble visually you know then-I think he had the one model for DNA 3D.</p>	<p>Use of Visuals</p>

Finished narrative as it appears in dissertation:

Jodi: Second period had a hard time, but thankfully Kevin ran in [the storeroom] and grabbed out the model. I got to a point where I was showing a [PowerPoint] slide, and even though [there were] graphics up there, [we] still saw a few blank looks. He ran and grabbed a model and I think that helped. People see a flat thing on a screen, but seeing a 3D [model] can sometimes help. That was really great that he had that for third period. [The lesson] needed those extra props.