

CRITICAL REFLECTION AND TEACHER CAPACITY: THE SECONDARY
SCIENCE PRE-SERVICE TEACHER POPULATION

by

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of the requirements for the degree

of

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in

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DEDICATION

This manuscript is dedicated to all of the teachers and students who have inspired me on this journey.

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ABSTRACT

This qualitative study seeks to understand the development of secondary science pre-service teachers. A case study is developed about each of the five participants, in effort to answer the research questions, which are: How did critical reflection inform teacher capacity within the secondary science pre-service teacher population? What knowledge, skills, and dispositions facilitated secondary science pre-service teachers in developing a critically reflective practice?

It is the author's expectation that by teaching these pre-service educators to develop their skills of critical reflection by using external methods of assessment such as videotaping, peer feedback, and student work, the participants in this study will increase and expand their capacity as teachers, or their "innate potential for growth, development, and accomplishment" (McDiarmid & Clevenger-Bright, 2008), and be better prepared to accomplish the goals that are expected of a master teacher.

Data is collected from interviews, participant work samples, and observations from the researcher and other key individuals who worked with each participant, such as: the methods instructor, university supervisors, and cooperating teachers. Over the course of two semesters, the researcher developed a detailed description of each of the participants through analyzing passages selected from interview transcripts and student work samples for reflection type, factor of teacher capacity, and commonplace interaction group.

The first outcome of this study includes an understanding of the relationship between critical reflection and teacher capacity and the knowledge, skills and dispositions that facilitate the development of a critically reflective practice. The second outcome of this study was the development of a new adaptation of a teacher interaction model (commonplace interaction groups) based on Schwab's *Commonplaces of Educating*. Lastly, three conclusions were drawn about the five participants in this study: There was a change in the participants' reflection level from the methods semester to the student teaching semester, most shifted their focus of reflection from teacher-self to teacher-student, and the weakest area of reflection with all participants was content / subject area and curriculum / standards.

CHAPTER 1

INTRODUCTION TO THE STUDY

The Study

This study focused on the development of critical reflection and teacher capacity as a function of the reflective teaching practices of secondary science pre-service education majors. In this case, ‘critical reflection’ was interpreted to mean the practice of examining one’s work through a method other than one’s memory. Videotape of teaching performances, peer feedback, and participant work samples were all ways that secondary science pre-service teachers viewed their work through critical reflection in this study. It was the researcher’s belief that preparing pre-service teachers to understand and to be comfortable with this critically reflective practice would encourage them to become better educators. When a professional educator is a critically reflective teacher, s/he understands that there are always changes to be made in his/her teaching.

In this study the concept of ‘teacher capacity’ describes the knowledge, skills, and dispositions needed for teachers to be professionally successful. Teacher capacity focuses on the evolving nature of educating, and the social and political ramifications of one’s practice as an educator. Schwab’s *Commonplaces of Educating* (1973) were used as a conceptual organizer for ten factors of knowledge, skills, and dispositions that were identified within the teacher capacity literature.

The study sample was composed of five secondary science pre-service teachers. A case study research methodology was chosen, employing interviews, observations, and

work samples as data acquisition methods. The subjects participated in the study for two semesters. The study took place in two locations; the first was the university where each of these participants was enrolled, and the second was the public school where the subjects completed their student teaching.

Expected outcomes of this research included a better understanding of the knowledge, skills and dispositions needed for secondary science pre-service educators to develop a critically reflective practice. In addition, careful examination of the data revealed several unexpected outcomes. Through the analysis of reflective passages, the author found that the participants reflected mostly about the commonplace interactions between the teachers and their students. There was less emphasis on reflection related to content or subject area, curriculum, and national or state standards.

National and State Teacher Guidelines

One of the most important policies influencing the preparation of pre-service teachers in this study was The No Child Left Behind (NCLB) Policy. Passed in 2001, the NCLB act is an ongoing effort that originated from the United States Department of Education. No Child Left Behind is designed to close the achievement gap among students and to ensure that all students realize academic proficiency. The four major aspects of NCLB are (1) to provide stronger accountability for results, (2) to create more freedom for states and communities, (3) to use proven education methods, and (4) to provide more choices for parents. The accountability criteria is of specific concern to teachers and administrators, and it has changed the way the government and the public

view teachers. It is often observed that this measurement system for teachers and schools does not consider all of the factors that are influential in the education of today's students.

By understanding the progress and intentions of the current policies, teacher educators can better prepare pre-service teachers for their professions. The National Council for Teacher Quality (NCTQ) reported on the progress of NCLB in 2006, 2007, and 2008 in *The State Teacher Policy Yearbook*, which quantifies national and state results in a yearly report. The Yearbook reported that approximately five years after the implementation of the No Child Left Behind Policy, only two states were meeting the goals. Twenty-one states met a small part of the goals, and 27 of the 50 states were nearly meeting the goals (National Center for Teacher Quality, 2007). The report indicated that less than four percent of the United States was meeting the NCLB Teacher Quality Objectives, with a grade of "B", and the remaining states earned a "C" or a "D". In 2008, however, the Yearbook showed that 26% of the states were meeting the goals of the No Child Left Behind Policy. Although the progress of the states has increased in respect to the NCLB standards, most professionals believe there is room for improvement.

The National Council for Teacher Quality also lists primary findings that impact the preparation of the pre-service teachers in this study. Among these, the NCTQ has found that "States are not doing enough to help districts identify effective teachers" (2008, p. 1). It is difficult to determine which teachers will be effective before they begin to teach. Because of this, the NCTQ recommended that these effective teachers should be identified early in their careers and, if possible, prior to being awarded tenure. Secondly,

“State policies raise barriers and offer few incentives to retain effective teachers” (2008, p. 2). According to the NCTQ report, states do not do as much as they could to retain effective teachers. NCLB and NCTQ reports indicate that our nation’s quest to improve education is a daunting task. It is important that teacher educators and pre-service teachers understand that it will take time and effort among all states to reach the NCLB goals.

Understanding the culture in which pre-service teachers will begin their careers is essential to teacher educators. They must prepare prospective teachers for a career that, for the most part, takes place in a workforce that is regulated by government policy. Critical reflection helps pre-service teachers develop a sense of ownership in their work. By demonstrating that they are performing to the expected standards, they gain ownership in their careers, pride in themselves, and eventually establish professional security. Developing skills of critical reflection requires a view of educational policy that is not “top-down”, but rather a partnership in educating students. Critically reflective, pre-service teachers can be an important component of educational reform.

Professional Development and Standards

Professional standards created by national accrediting organizations provided a convincing argument for the inclusion in this study of critical reflection in today’s professional expectations for science teachers. There are several important institutional and professional contributions that relate to critical reflection by science teachers. National associations, whose primary goal is the education of K-12 students (and in

particular, their science preparation), have developed professional standards that include teacher reflection as part of effective practice. The National Research Council (NRC), National Council of Accreditation of Teacher Education (NCATE), Interstate New Teacher Assessment and Support Consortium (INTASC), and the National Science Teachers' Association (NSTA) are the main governing bodies whose policies influenced this study.

The National Research Council created a number of professional education standards for science teachers that influenced the focus of this study. According to the NRC it is expected that teachers will be self-reflective. The underlying reasoning for this standard is twofold. First, teachers should model reflective behavior by using student data, observations of teaching, and interactions with colleagues to reflect on and improve their teaching practices. Second, they should help their students understand the purposes of their own learning, and to formulate self-assessment strategies (NRC, 1996). By engaging in their own self-assessment strategies, or critical reflection, as described above, teachers will be better prepared to guide their students in critical reflection as a process of self-assessment.

Critical reflection was viewed by the researcher as a type of inquiry learning. Inquiry is intimately connected to scientific questions – “students must inquire using what they already know and the inquiry process must add to their knowledge” (National Research Council, 2000, p. 13). When teachers practice critical reflection, they are inquiring into their practices using what they already know, asking questions and examining their practice through an outside evaluator (such as videotape, peer feedback,

or student work), and thus adding to their professional knowledge. Developing skills of critical reflection among pre-service teachers encourages them to identify aspects of their teaching that do not effectively address the needs of all students. In fulfillment of the National Science Education Standards, pre-service teachers can fulfill their capacity as educators by critically reflecting upon and inquiring into their practices.

Another important influence on this study was the National Council of Accreditation of Teacher Education (NCATE), which is a professional organization that is recognized by the Department of Education and certifying teacher education programs in the U.S. The National Science Teachers' Association (NSTA) has partnered with NCATE to develop standards specifically for the preparation of science teachers. This study reflects the core values of NCATE and NSTA, by examining the development of prospective teachers as they learn to critically reflect upon their own practices. When secondary science pre-service teachers develop reflective practices, and understand that this is part of their responsibility, the value of accountability and improvement can be embedded in their professional knowledge, skills, and dispositions. By critically reflecting upon their practices, secondary science pre-service teachers examine their interactions with the social environment, their students, and the curriculum. As a result of developing critically reflective practices, all pre-service teachers have the potential to impact educational reform by recognizing and addressing the personal, professional, social, and political aspects of teaching.

The institutional goals of the teacher education program in this study were also based on the standards created by the Interstate New Teacher Assessment and Support Consortium (INTASC). INTASC's mission is:

To provide a forum for its member states to learn about and collaborate in the development of compatible educational policy on teaching among the states, new accountability requirements for teacher preparation programs, new techniques to assess the performance of teachers for licensing and evaluation, and new programs to enhance the professional development of teachers (Council of Chief State School Officers, 2007).

Specific to science education, there are ten principles involved in preparing career educators. One of the key components of the standards developed by INTASC is that “a teacher of science is a reflective practitioner who continually evaluates the effects of their choices and actions, and who actively seeks out opportunities to grow professionally” (Interstate New Teacher Assessment and Support Consortium Science Standards Drafting Committee, 2002, p. 6). Specific to critical reflection, INTASC states that “Self-reflection and going beyond description to include analysis provides a mechanism for teachers to gauge their growth in all aspects of their professional life including knowledge of science content, students, pedagogy, learning and assessment” (Interstate New Teacher Assessment and Support Consortium Science Standards Drafting Committee, 2002, p. 6). In this study, the researcher adapted this idea to include critical reflection and its property as a mechanism to describe secondary science pre-service teachers' growth in all areas of teacher capacity.

Interstate New Teacher Assessment and Support Consortium guidelines indicate that critical reflection is a flexible and adaptable process, focusing on various aspects of one's professional practice “They [teachers] conduct classroom-based research to better

understand the effect of their teaching on student learning, and they understand the value of peer coaching and mentoring” (INTASC, 2002, p. 6). Within the science education profession, the requirement to conduct research in one’s classroom is complementary to the nature of science itself. As a function of taking science courses and majoring in science, we trust that science teachers are trained in investigating, creating experiments, collecting data, and using research as a process of science. This emphasis on the nature of science and science processes can be naturally extended to systematically investigating the teachers’ educational beliefs and practices.

While the organizations that have been discussed in the previous paragraphs have made it a priority to use the process of research and practice when creating frameworks for the requirements of a teacher education program, and have used student learning as a method of informing their criteria, there are other entities to which a teacher must answer. As public servants, teachers are cognizant of those who influence education. Media and word-of-mouth communication is the conduit used by these entities to distribute information. These entities, or “key others, such as journalists, community members, taxpayers, policymakers, textbook publishers, and so on” (McDiarmid and Clevenger-Bright, 2008, p. 144), influence a teacher’s preparation and performance in the workplace. As such, they must be part of critical reflection to improve teacher capacity.

Critical Reflection and Teacher Capacity

In this study, the researcher asked: “What is critical reflection and teacher capacity, and what is the relationship between the two concepts as it relates to pre-service

science education?” Reflection is an essential part of the “critical consciousness” (Howard & Aleman, 2008, p. 166), which is included in the current understanding of teacher capacity. Critical consciousness implies that teachers should be politically and socially aware of the nature of their own work.

Critical reflection is considered a part of intrapersonal knowledge; that is, a factor of teacher capacity focusing on knowledge of one’s self and one’s practice. Critical reflection enables teachers to assess their social and political biases by examining their practices based on reliable data from outside sources, such as video, peer feedback, or student work. Participating in this “culture of evidence” (McDiarmid & Clevenger-Bright, 2008, p. 146) can help encourage teachers to examine and change their teaching practices with the goal of reaching all students. It is crucial for secondary science pre-service teachers to develop critical reflection, because by understanding and adopting this practice, pre-service teachers have access to a systematic process that they can use to strengthen their professional capacities.

The concept of “teacher capacity” (Cochran-Smith, Feiman-Nemser, & McIntyre, 2008) informs our current understanding of the knowledge, skills, and dispositions that teachers should possess to be effective educators. In order to be effective educators, secondary science pre-service teachers are expected to develop knowledge, skills, and dispositions to fill many different roles and meet a variety of professional obligations. Professional knowledge, skills, and dispositions are the keystones of any beginning teacher’s success. Although each educator, classroom, student, and school is unique within itself, there are similarities among all American schools: pre-service education

programs meeting professional standards attempt to help guide novice teachers in their professional development. An important part of this preparation is the development of critical reflection.

Teacher educators' understanding of what teachers should know, be able to do, and think has changed throughout the years. The word 'capacity' means "the ability to receive, hold, and absorb," or "the power to learn or retain knowledge; mental ability," or "innate potential for growth, development, or accomplishment" (McDiarmid & Clevenger-Bright, 2008). Teacher capacity is a continual, life-long professional development activity that enables teachers to be flexible and adaptive in their practices. This study investigates the knowledge, skills, and dispositions essential for secondary science pre-service teachers to critically reflect as part of their developing teacher capacity.

Statement of the Problem

Because there are numerous recommendations about what teachers should know, do, and think, the factors of teacher capacity often are taken for granted or assumed. This study examined the development of the participants' teacher capacities as they developed critically reflective practices. As these skills become part of teacher preparation and professional practice, novice teachers will be better prepared to increase and expand their "innate potential for growth, development, and accomplishment" (McDiarmid & Clevenger-Bright, 2008).

There are no published studies that specifically connect critical reflection with teacher capacity in a qualitative case study design. This study resulted in a descriptive, detailed view of secondary science pre-service teachers' development during the last two semesters of their teacher preparation programs. The use of peer feedback, videotaped lessons, and response journals as data acquisition methods is unique to this study.

Statement of the Purpose

In this study, the development of professional knowledge, skills, and dispositions during the pre-service teacher preparation process was of particular interest. The development of teacher capacity and how it relates to critical reflection was investigated. Five undergraduate students in the secondary science teacher education program were studied for the two final semesters of their undergraduate programs. An in-depth and detailed case study about each of the participants was developed.

Research Questions

The questions that guided this research evolved throughout the study. Ultimately, this study attempted to answer the main focus question (MFQ): How did critical reflection inform teacher capacity within the secondary science pre-service teacher population? As described previously, reflection is identified by several governing bodies (INTASC, NCATE, NSTA, NRC) as an important part of a teacher's body of knowledge, skills, and dispositions. Critical reflection, or using evidence aside from one's thoughts to inform one's teaching practice, is part of the "culture of evidence" that is called for by the

Handbook of Research on Teacher Education (2008). The expanding development of the view of what teachers should know, be able to do, and believe, or teacher capacity, combined with the outcomes of critical reflection, provided a conceptual framework for this study of secondary science pre-service teachers.

Three sub-focus questions (SFQs) contributed to answering the main question.

The SFQs were:

1. What knowledge facilitated secondary science pre-service teachers in developing a critically reflective practice?
2. What skills facilitated secondary science pre-service teachers in developing a critically reflective practice?
3. What dispositions facilitated secondary science pre-service teachers in developing a critically reflective practice?

Research Methodology

This research was based on case study methodology. The selection of case study provided an in-depth look at each individual participant and the results used as a way to compare key individual experiences among the group. The researcher developed five case studies of secondary science pre-service teachers using interviews, journals, and observations to triangulate themes found within the analysis of the written transcripts of these data sources. Each of the data acquisition methods provided an individual perspective on the data and increased the accuracy and credibility of the findings (Patton, 2002). Videotapes of the participant's teaching were used in three ways: To guide the

interview questions, to provide clarity to the researcher's observations (field notes), and as a prompt for critical reflection in participant work samples.

The interview transcripts and student work samples were analyzed line by line, and reflective passages were identified and extracted, then coded for reflection type and factors of teacher capacity. These factors of teacher capacity were later interpreted through the participants' interactions within the common areas of educating: their own teaching, their students, the curriculum, and the social environment. It is important to emphasize that the main focus of this study was the development of the pre-service teachers' abilities to critically reflect; therefore, the progress of their students was not considered within this study.

The five participants in this research project were studied for two consecutive semesters. The first, referred to as the 'Methods Semester,' was a capstone methods course, in which pre-service teachers practiced teaching using the skills they had learned from the previous three years of undergraduate classes. During this semester, participants enrolled in the Methods of Teaching Secondary Science class, and a 45-hour clinical field experience. The second semester, referred to as the 'Student Teaching Semester,' involves a twelve- or fourteen-week time period in which the participants enrolled in a class called the Student Teaching Practicum. A full description of these courses is located in Appendix A. The researcher was a graduate teaching assistant in the Methods of Teaching Secondary Science class, and a university supervisor of the clinical field experience during the methods semester.

Context

The university where this study was conducted included a Department of Education, housed within the College of Education, Health, and Human Development. The department included three program areas: Curriculum and Instruction, Educational Leadership, and Adult and Higher Education. The Curriculum and Instruction division included programs in elementary education and secondary education, as well as a master's and a doctoral degree program for advanced professional development. All of the participants in this study were seeking an undergraduate degree in secondary science education, meaning that their program of study was located within the Curriculum and Instruction division. The Department of Education Program Basics is provided in Appendix B.

Within the Secondary Education Program, undergraduate students are able to choose between several options to pursue preparation as a science educator. Option one is to major in Secondary Education. To do this, one must also have chosen 'General Science Broadfield,' which is the option that "prepares and provides certification for prospective middle and senior high school teachers for all school science areas [such as biology, chemistry, earth science, or physics]" (University Course Bulletin, 2008, p. 113). Option two is to have had a subject area major [Biology, Chemistry, or Physics] with a teaching option. To do this, students majored in the appropriate science department outside the Teacher Education Program.

Significance of the Study

This study contributed to the existing teacher preparation knowledge base as it related to critically reflective practices among secondary science pre-service teachers. The relationship between critical reflection and teacher capacity provided insight into specific teacher education practices and pre-service student outcomes related to critically reflective practice and development of knowledge, skills, and dispositions. This study helped define criteria related to critically reflective practice by defining what critical reflection looked like in the teacher education program. With the knowledge of these criteria, teacher educators can increase the use of critical reflection in the pre-service classroom, providing the opportunity for pre-service teachers to develop proficiency in this skill prior to entering the workforce.

This study encouraged pre-service teachers to gain an appreciation for their own learning in the process of teaching, and to develop an understanding that they are partners in learning. It is possible that participating in critical reflection activities as pre-service educators helps individuals view themselves as constantly evolving and growing professionals. Results indicate that the participants believed that the reflection activities practiced in this study were a useful way for them to provide evidence of effective teaching and learning and to build a professional, standards-based rationale for their practices.

Summary

This study focused on the role of critical reflection in teacher capacity, and how the knowledge, skills, and dispositions of secondary science pre-service teacher candidates developed the skills of critical reflection during their pre-service program. The concepts of critical reflection and teacher capacity have been addressed in the educational research literature but not combined until this study. The research methodology was case study and the data acquisition methods employed included interviews, direct and video observations, and student work samples of five undergraduate science education pre-service students over the course of two semesters. Research outcomes informed our conceptual understanding of the theoretical foundation and the development of knowledge, skills and dispositions related to critical reflection.

CHAPTER 2

THEORETICAL FRAMEWORK

Introduction

The main research questions of this study were: How does critical reflection inform teacher capacity within the secondary science pre-service teacher population? What knowledge, skills, and dispositions are necessary to develop a critically reflective practice? This chapter addresses the recent and current theoretical and empirical literary works that built the foundation of this study. Teacher capacity, commonplace interaction groups, critical reflection, and current literature are the four main sections of this chapter, illustrated in Figure 2.1.

It is important to note that the order in which these main sections were discussed in this chapter is different from the order that these ideas were discussed in the rest of this manuscript. Specifically, in this study, critical reflection was addressed prior to teacher capacity because critical reflection is the organizing principle of the research study. However, in chapter two, teacher capacity and Schwab's *Commonplaces of Educating* were discussed prior to critical reflection. The author chose to present the topics in this way in chapter two only, because it provided a logical organizational framework leading to the conceptualization of critical reflection, as well as those ideas that are informed by critical reflection.

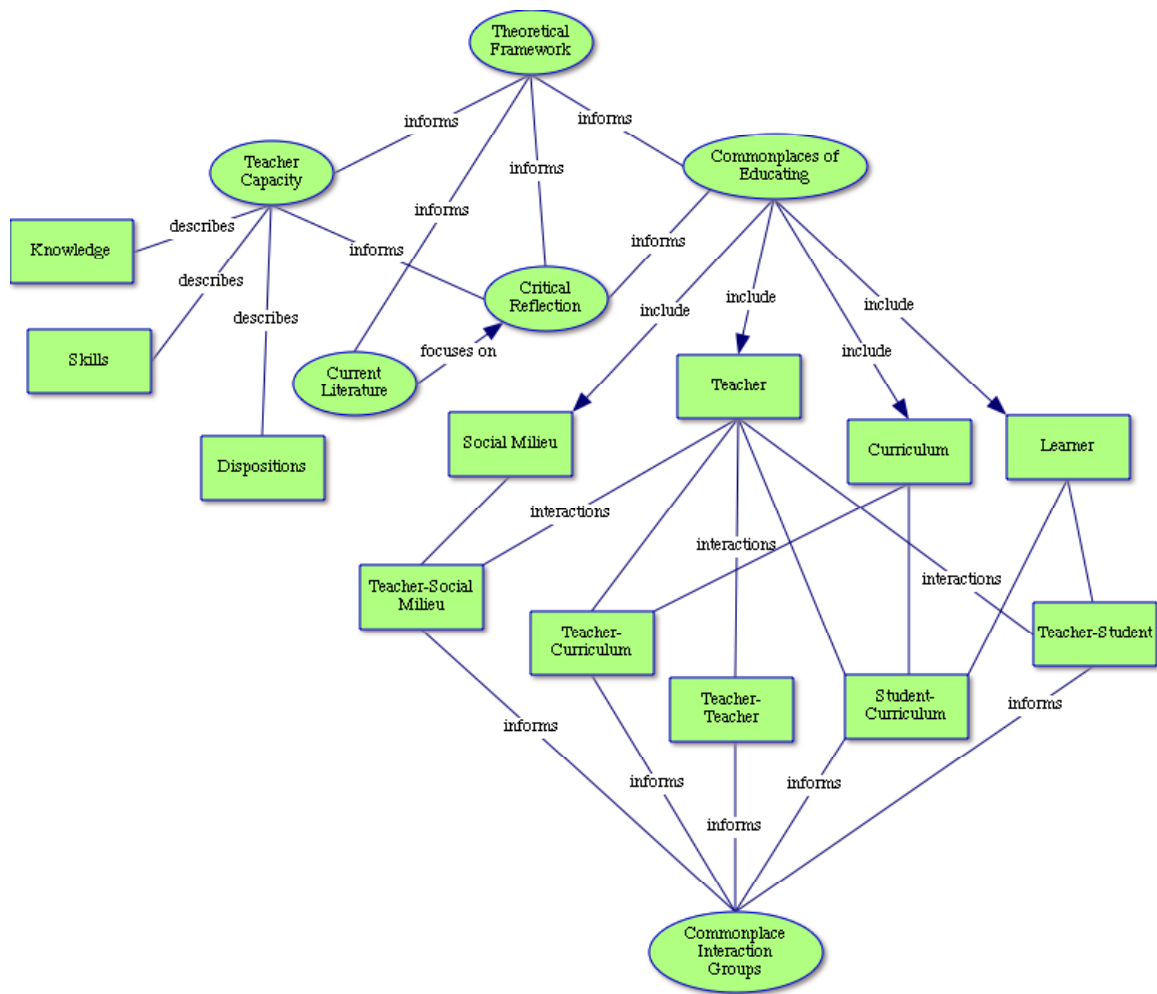


Figure 2.1: Concept map of the main sections discussed in chapter two.

The first section of this chapter addresses teacher capacity. The researcher examined the theoretical and empirical literature from the areas of teacher knowledge, teacher beliefs, teacher thinking, and teacher education in order to identify models of teacher knowledge that were well known and/or pertinent to this study. A review of these models of teacher knowledge resulted in a compilation of ten factors that the researcher determined were important for understanding the development of knowledge, skills, and dispositions of secondary science pre-service teachers.

The second section of this chapter addresses the details of Schwab's (1978) *Commonplaces of Educating* and how they relate to the factors of teacher capacity. The *Commonplaces of Educating* (Schwab, 1978) describes four factors that exist within the action of educating: The teacher, the learner, the curriculum, and the social milieu. While teacher capacity describes the specific knowledge, skills, and dispositions necessary for a successful teacher, the commonplaces of educating address the experience of educating, and the events that happen during that process. A new adaptation of the *Commonplaces of Educating* was developed specifically for this study to address the interactions of the commonplaces. The interactions model addresses the dynamic relationships between the teacher and each of the commonplaces. This re-conceptualization provides a framework for the classification of the key characteristics of teacher capacity.

The third section of this chapter focuses on the concept of critical reflection, and begins with a developmental view that traces the evolving understanding of critical reflection through the concepts of reflective thinking, reflective teaching, and reflective learning. The main ideas are summarized in a definition of critical reflection and emphasize how critical reflection relates to both teacher capacity and the commonplaces of educating.

Finally, the fourth section of this chapter identifies research that has been conducted about pre-service and in-service secondary science teachers and their development of a reflective teaching practice. The researcher emphasizes the gaps in the empirical literature and summarizes the major findings from each of the theoretical frameworks that support this study.

Teacher Capacity

In today's educational world of state standards, accountability measures, government policies on education, and high-tech media, it seems as though everyone has an opinion of what teachers should know. However, this is not a new idea. The "what teachers should know" debates began over a century ago as a theoretical and empirical discussion. In 1897, John Dewey suggested that the educational process should be looked at as a "complex endeavor, which required knowledge and understanding of multiple domains of teaching and learning" (cited by Howard and Aleman, 2008, p. 161). One can deduce that if the educational process is complex, the knowledge, skills, and dispositions that teachers should have to facilitate the educational process is at least equally, if not more complex. Today, the knowledge, skills, and dispositions of a "good teacher" continue to be widely discussed. A comprehensive search of literature that has been published within the last twenty years led the researcher to the selection of five key models of teacher knowledge that contribute to the understanding of teacher capacity. In this section of chapter these models of teacher knowledge are described, definitions for each of the factors of teacher capacity that were selected from these models are proposed.

Models of Teacher Knowledge

The models of teacher knowledge, or teacher capacity which were chosen to create the framework of this study are: Knowledge in Teacher Education (Shulman, 1987), Cornerstones of Professional Knowledge (Grossman, 1990), The Triad of Teacher Knowledge (Collinson, 1996), Models of Teaching and Learning (Turner-Bisset, 2001),

and Teacher Capacity (Handbook of Research on Teacher Education, 2008). Figure 2.2 illustrates how each of these models contributes to the understanding of how teachers' knowledge, skills, and dispositions relate to teacher capacity.

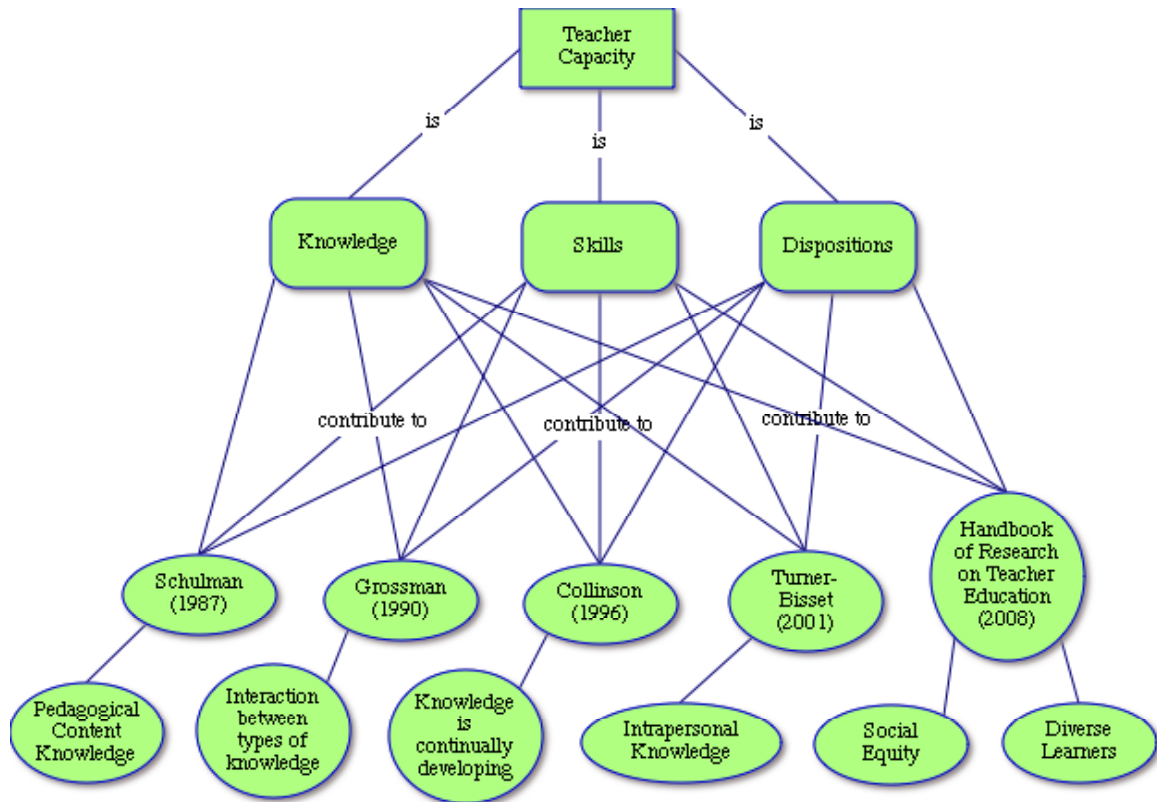


Figure 2.2: Concept map of how the selected models of teacher knowledge inform the definition of teacher capacity that was used in this study.

Knowledge in Teacher Education: In 1987, Shulman addressed the question of a knowledge base for teachers. His broad description of the necessary knowledge for teachers was: Content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, and knowledge of educational ends. Shulman was the first to discuss pedagogical content knowledge, a type of knowledge

that “represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners” (1987, p. 8). Shulman’s approach to thinking critically about teacher knowledge and pedagogy guided this study.

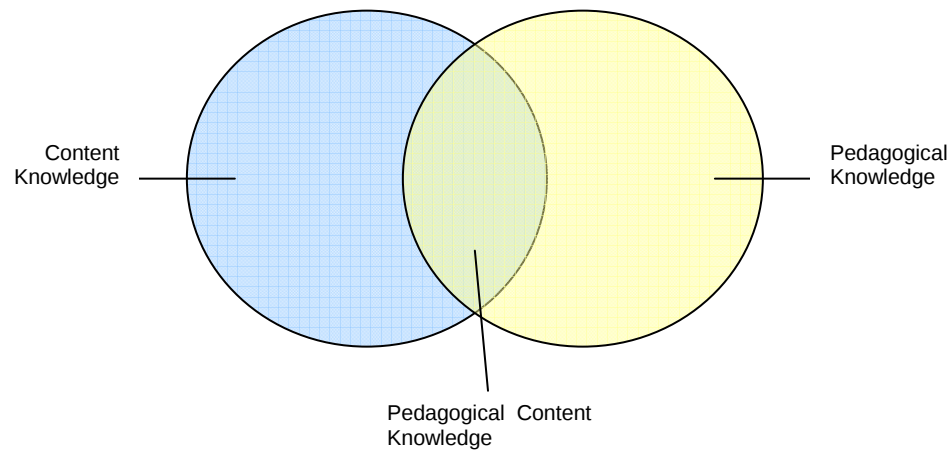


Figure 2.3: The researcher’s graphical representation of pedagogical content knowledge.

Cornerstones of Professional Knowledge: In this model of teacher knowledge, Grossman (1990) did not focus as much on the categories of teacher knowledge, but the interaction between these bodies of knowledge. An illustration of this model can be seen in figure 2.4. The four cornerstones of a teacher knowledge base according to Grossman include subject matter knowledge, general pedagogical knowledge, pedagogical content knowledge, and knowledge of context. The interaction between pedagogical content knowledge and knowledge of context, as well as the interaction between pedagogical content knowledge and subject matter knowledge and general pedagogical knowledge is bi-directional. Grossman’s model of teacher knowledge was selected as part of the

theoretical framework for this research study because of the interactive nature of the components of knowledge.

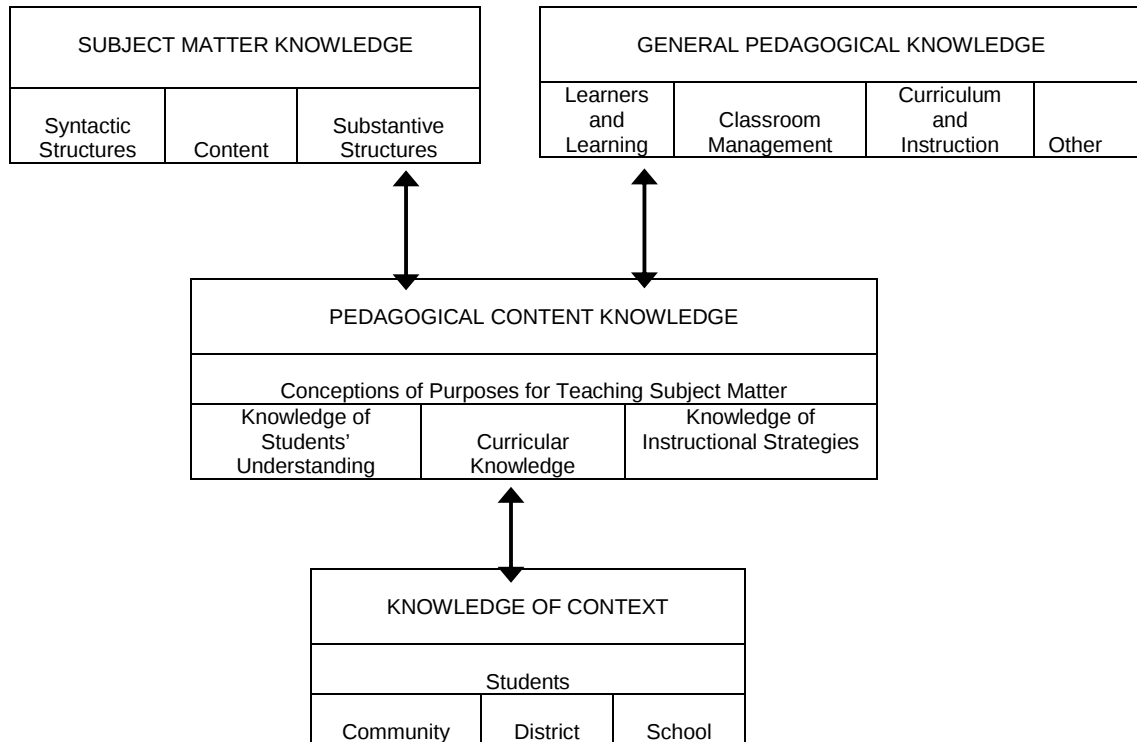


Figure 2.4: Illustration of Grossman's Model of Teacher Knowledge (1990, p. 5).

Triad of Teacher Knowledge: Collinson (1996) proposed continuous development of a triad of knowledge that included professional knowledge, interpersonal knowledge, and intrapersonal knowledge. Her emphasis on interpersonal and intrapersonal bodies of knowledge was of particular interest to the researcher, because Collinson believed that both “people skills” (interpersonal knowledge) and “self skills” (intrapersonal knowledge) were essential in a teacher's body of knowledge. In addition, the perspective that a teacher's body of knowledge is continually changing is of particular importance to

this study's view of teacher capacity, because it is a theme that is repeated by Howard & Aleman (2008) in their definition of teacher capacity.

Models of Teaching and Learning: Turner-Bisset (1999) proposed twelve components in her model teacher knowledge. The types of knowledge that Turner-Bisset considers critical are: Substantive subject knowledge, syntactic subject knowledge, beliefs about the subject, curriculum knowledge, general pedagogical knowledge, knowledge / models of teaching, cognitive knowledge of learners, empirical knowledge of learners, knowledge of self, knowledge of educational contexts, knowledge of educational ends, and pedagogical content knowledge. The researcher found this model of teacher knowledge of importance to this study because it includes the component of self-knowledge which is essential to critical reflection and teacher capacity. Turner-Bisset's model also includes empirical knowledge of learners, highlighting the value of experience in the model of teacher knowledge.

Teacher Capacity: Howard & Aleman (2008) addressed the question teacher capacity and how it develops over time. Their term to describe the knowledge, skills, and dispositions a teacher should have as "teacher capacity". The key characteristics of teacher capacity are:

- Teachers must have a positive attitude towards, keep pace with *and* lead change in the realm of technological, scientific, and societal advancements.

- Teachers' knowledge must become deeper and more flexible, including having an understanding of the relationship between content knowledge and pedagogical content knowledge.
- Teachers must have skills such as a wide array of grouping strategies and assessment techniques.
- Teachers must be committed to student learning and the *paramount* perspective that all students can learn.

This model of teacher capacity was important to this study because the knowledge, skills, and dispositions that are necessary for teachers represent our most recent thinking about this topic. This model includes teachers as leaders in educational change and emphasizes that all students can learn. These ideas are fundamental to the researcher's philosophy of teaching, learning and educational research.

Framework for a Definition of Teacher Capacity

The factors of teacher capacity that were drawn from these models to create a framework for the design of this study are illustrated in Table 2.1. Each of the teacher capacity factors is supported by one if not several of the previously described models of teacher knowledge. Because teacher capacity defines factors of teacher ability as rapidly evolving and changing, and teacher capacity itself is continually being developed (Feiman-Nemser, 2008), it is important to have a broad starting definition of the factors to which we are referring.

Table 2.1: Analysis of factors of teacher capacity identified within models of teacher knowledge.

Empirical and Theoretical Models of Teacher Knowledge	Factors of Teacher Capacity									
	Pedagogy	Content / Subject Area	Curriculum / Standards	Pedagogical Content Knowledge	Interpersonal / Communication	Intrapersonal / Self	Knowledge of Students / Diverse Learners	Growth / Adaptive Expertise	Models of Teaching	Social Responsibility / Context
Howard & Aleman (Handbook of Research on Teacher Education, 2008)	X	X	X	X	X	X	X	X	X	X
Models of Teaching and Learning (Turner-Bisset, 2001)	X	X	X	X	X	X	X		X	X
Triad of Teacher Knowledge (Collinson, 1996)	X	X	X		X	X	X			X
Cornerstones of Professional Knowledge (Grossman, 1990)	X	X	X	X						X
Knowledge Base for Teachers (Shulman, 1987)	X	X	X	X						X

By addressing each of these factors separately, this research provides insight into each specific factor of what a teacher needs to think, do, and feel. Because ten factors have been discussed in the coming pages, the reader may find it useful to use Table 2.3 as a reference guide. For the purpose of this study, teacher capacity includes the following factors: pedagogy, Content / Subject Area, curriculum / standards, pedagogical content knowledge, interpersonal, intrapersonal / self, knowledge of students / diverse learners, growth / adaptive expertise, constructivism / inquiry, and social responsibility / context.

Pedagogy: Pedagogy encompasses practical aspects of teaching, curricular issues and the theoretical base of how and why learning takes place.

Pedagogy also includes “special reference to those broad principles and strategies of classroom management and organization that appear to transcend subject matter” (Shulman, 1987). This factor of teacher capacity includes a general body of knowledge about learning, instructing, and learners, including classroom management. The factor of pedagogical knowledge is an essential part of a teacher’s professional knowledge (Shulman, 1987, Collinson, 1990, Turner-Bisset, 2001).

Content / Subject Area: Content knowledge is a necessary part of a teacher’s professional knowledge (Shulman, 1987; Collinson, 1990). Teacher capacity is based on a strong understanding of content or subject matter, substantive knowledge; the facts and concepts, the framework that organizes those facts and concepts, and syntactic knowledge; the ways and means that knowledge of the subject has been gained (Turner-Bisset 2001; Grossman, 1990; Schwab 1964; 1978). Content and subject area knowledge are especially important for secondary science pre-service teachers, because they are typically expected to be science content specialists. Past research indicates a significant positive correlation was found between the number of science content courses taken by teachers and the positive dispositions of their students toward the subject (Howard & Aleman, 2008, p. 159).

Pedagogical Content Knowledge: Shulman (1987) conceived the idea of pedagogical content knowledge by combining pedagogical knowledge and content knowledge. He described pedagogical content knowledge as “that special amalgam

[blend] of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding” (1987, p. 8). The recognition of that special form of professional understanding that was inherent to teaching was beginning of a paradigm shift in the discourse of educators and educational researchers. By asking questions of teachers about how they think, Shulman encouraged educational researchers to start considering their work in a bi-directional manner; instead of continuing to conduct research for the purpose of informing teachers, they would now consider how teachers’ practices could inform their work. This type of thinking about teacher’s practice informing educational research marks a transition out of what Zeichner and Liston describe as the Social Efficiency Tradition, where “teachers focus their reflections on how well their own practice matches what external researcher says they should be doing” (1996, p. 56), and brings forth an increasing complexity in the quality of reflection and thinking that was being conducted about educational research.

The idea of viewing both content knowledge and pedagogical knowledge as equal parts of a whole requires that we pay equal amounts of attention to content and pedagogy (Zeichner, 1991). “Since there are no single most powerful forms of representation, the teacher must have at hand a “veritable armamentarium of alternative forms of representation, some of which derive from research whereas others originate in the wisdom of practice” (Shulman, 1986, p. 18). Pedagogical content knowledge includes:

For the most regularly taught topics in one’s subject area, 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. We ought to expect that the mature teacher possess such understandings about the curricular alternatives available for

instruction. . . [including an] understanding of materials for instruction, the alternative texts, software, programs, visual materials, single-concept films, laboratory demonstrations, or ‘invitations to inquiry’ Pedagogical content knowledge also includes 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 to the learning of those most frequently taught topics and lessons. If those preconceptions are misconceptions, which they so often are, teachers need knowledge of the strategies most likely to be fruitful in reorganizing the understanding of learners, because those learners are unlikely to appear before them as blank slates (Shulman, 1986, p. 9-10).

These ideas about pedagogical content knowledge are an attainable goal, however it realistically may take quite a few years for a teacher to reach this level of performance. Until then, Turner-Bisset (2001) suggests the use of pedagogical content knowledge as a way to “identify the gaps in one’s knowledge” (p. 156). By understanding the different perspectives from which one is expected to teach, Turner-Bisset believes that a teacher would be able to identify and remedy the aspect of teaching in which he or she is weak.

Curriculum / Standards: In this factor of teacher capacity, curriculum is defined as the content and specifications of a course or program of study. Collinson emphasizes that exemplary teachers will “use a variety of open-ended, applied projects so children can practice the reflective process, link subject matter to real life situations, and think of creative products to demonstrate their learning” (1996, p. 11; Turner-Bisset, 1999).

Teachers should be able to critically evaluate the curricular they have access to, and seek out or create materials that are most appropriate to their class and their students.

Curriculum itself should be student-centered and inquiry oriented. National, State, and Local standards are a means of defining the quality—of work or of performance—that must be attained by students. A well-trained teacher will be knowledgeable of and have

the ability to implement activities within the curriculum that fulfill the objectives of these standards.

Interpersonal / Communication: This factor of teacher capacity focuses on building relationships through communication with one's students and others, with the overall goal of creating a community of learners. In addition, building relationships with one's broader educational community, or the local community, is part of this focus. Interpersonal skills are important for teachers, because teaching depends on this type of skill. These skills are especially important for pre-service teachers (Collinson, 1996; Turner-Bisset, 1999), as it is easy for them to become isolated within their classroom.

Intrapersonal / Self: This factor of teacher capacity includes the ability for introspection and reflection. In this study, critical reflection is viewed as the highest level, and to accomplish this, pre-service teachers need confidence and a sense of self-image. Participants used evidence such as videos of their teaching, student work, or peer feedback to see their practice from another point of view and to use information gained during this process to inform their teaching. It is important to recognize that intrapersonal skills require the participation of others to assist one in the process of critical reflection. This social aspect is important to critical reflection and to teaching in general. The new insight about one's self and behaviors gained by this type of reflection can dramatically affect one's communication with others (Collinson, 1996; Turner-Bisset, 2001).

Knowledge of Students / Diverse Learners: Knowing one's students and encouraging diversity includes respect for and understanding of empirical qualities such

as ethnic origin, national origin, religion, sexual preference, physical features, individual life choices (dress, food, music, lifestyle), cultural factors (dress, food, music, rituals, lifestyle), and body image, or cognitive diversity such as personality differences, or learning differences (Turner-Bisset, 2001).

Exemplary teachers . . . work hard to know students' interests, hobbies, backgrounds, and families. They tend to use this information to pique students' curiosity, help students link school to real life experiences, understand students' ways of thinking, and encourage tolerance of multiple perspectives within the classroom (Collinson, 1996, p. 12-13).

Whether learners are emotionally, mentally, or physically diverse, it is a teacher's responsibility to encourage dispositions of tolerance, curiosity, and celebration of all people among their students.

Teachers are expected to teach in ways that are responsive to the current culture of the students and the community. The demographics in this country are changing-- our students becoming more multicultural, while the majority of teachers in the workforce today are mostly Caucasian and monolingual (Grant, 2008). It is important for teachers to recognize this and work towards facilitating learning with all students, especially those who have shown to have lower scores on the tests for accountability. Pre-service teachers need not only to be able to recognize, honor, and celebrate the different cultures that comprise their classroom, they need to be prepared to close the gap that is created by the status quo.

Growth / Adaptive Expertise: A major feature of what a teacher should know, do, and believe as it relates to teacher capacity is fluidity. Teachers need to be able to grow, be flexible, and adapt to situations that change over time. The world itself and our

knowledge of it is changing frequently and rapidly. To have “adaptive expertise”, one must be resilient, flexible, and able to maneuver around the rapidly changing environment in which they work. They must also understand that learning to teach is ongoing (McDiarmid & Clevenger-Bright, 2008; Collinson, 1994). The factors necessary for growth and adaptive expertise require a disposition of thinking toward the future and a disposition towards optimism. With these dispositions, pre-service teachers grow and change through experience, as the skill of adaptive expertise and understanding of context cannot be simulated. It must be an ‘on the job’ learning experience.

Constructivism / Inquiry: As part of teacher capacity, the two main models of teaching focused on during this study were those of constructivist learning theory and inquiry teaching and learning. These two areas of focus were of primary importance in the curriculum of the science teaching methods class in which each participant was enrolled, and they have significant meaning in today’s view of education and learning. Constructivist theory states that learning is a process of constructing meaning, as opposed to receiving knowledge. The teacher is seen as a facilitator and partner in learning. The constructivist view has “profound implications for the teaching of diverse student populations” (Villegas, 2008, p. 554), as it allows students from diverse backgrounds to construct new knowledge, facilitated by the teacher, based on their prior knowledge, present experiences, and alternate perspectives.

Inquiry teaching and learning involves students being presented with experiences that encourage them to ask questions and conduct their own research. Students make hypotheses, experiment, collect data, and draw conclusions. Inquiry teaching and learning

is part of the National Science Education Standards, and should be built into a teacher's curriculum.

These two models of teaching are an important part of the participants' pre-service curriculum. Their use of constructivism and inquiry teaching and learning in their methods semester and student teaching semester was important because it not only is required by national and state standards, but one's facility with these two models of teaching could possibly be related to one's facility with developing a critically reflective practice.

Social Responsibility / Context: In this factor of teacher capacity, teachers must understand that the setting where education takes place is rich and consistently changing and developing. It is important for pre-service teachers to understand their social environment, and their consistently changing and developing responsibility as professionals within that environment. The size of the school, age of the students, the type of school, the community in which the students live, the class size, the support provided for teachers, evaluation and feedback, the quality of relationships between teachers, and the attitudes of the department chair, team leader, or administrators are all important factors that can influence pre-service and in-service teachers and their students (Shulman, 1987; Grossman, 1990; Turner-Bisset, 2001; McDiarmid & Clevenger-Bright, 2008).

Specific to this study, it is possible that there could be a link between a pre-service teacher's facility with interpersonal knowledge and social responsibility or context. "Exemplary teachers who continuously work at developing their interpersonal

knowledge begin to see increasingly complex issues and perspectives” (Collinson, 1996, p. 4).

In summary, with the understanding that the previously described factors of teacher capacity can, and will overlap among models of teacher knowledge, this study uses the main ideas that have been described to develop a framework of teacher capacity for secondary science pre-service teachers. It is important to note that what teachers should know has been and continues to be developed by theoretical and empirical research. The criteria of teacher capacity described here are supported by professional development organizations, as well as national and state standards.

Commonplace Interaction Groups

In the previous section, a framework was created from five separate models of teacher knowledge. Ten factors of teacher capacity were described as an example of the knowledge, skills, and dispositions that are necessary for secondary science pre-service teachers. In this section, an adaptation of a different model was constructed, one that addressed the process of educating. Each of the ten factors of teacher capacity was then located within this adaptation. Combining teacher capacity and an adaptation of Schwab’s (1978) *Commonplaces of Educating* resulted in a deeper, more meaningful understanding of teacher capacity, and helped build a conceptual foundation for understanding critical reflection in the context of this study.

In one day of a teacher’s life, there are many necessary interactions within the scope of their professional responsibility. An educational experience is a complex event

for all involved. These professional interactions can be categorized into several broad groups. Schwab (1978) described four distinct commonplaces: teacher, learner, curriculum, and social milieu. These entities contribute to the experience of educating, and “none of these is reducible to any other . . . each must be considered in educating” (Novak & Gowin, 1984, p. 6). In this study, understanding each of these groups and the teacher’s interactions with the groups led to a more meaningful understanding of educators and educating.

The first two commonplaces, in no particular order, are the teacher and the learner. In the teacher commonplace we find a person whose occupation is to instruct, guide, and facilitate the learning process. The learner, or student, is an individual who is participating in that learning process. The third commonplace, the curriculum, involves the curricular materials that are used in the educating process. This can be a year-long curriculum, a unit, or some other such organized plan. The fourth commonplace, the social milieu, represents the environment in which educating takes place. This includes the classroom, the school, the relationships between children in school and out of school, the relationships between teachers, as well as influences from the family and the community. Figure 2.5 illustrates these commonplaces.

The commonplaces of the teacher, the learner, and the curriculum all exist within the commonplace of the social milieu. Each of these commonplaces interacts with one another, and each is equal in the experience of educating. Figure 2.6 illustrates these interactions between each of the commonplaces. Each arrow between the commonplaces represents a bi-directional flow of information. For example, the teacher both gives and

receives information from the learner. This bi-directional flow of information is key to the educational process, because if the teacher does not find out how the information they are giving to the student has been received and understood, and is not professionally impacted by this information, the educational process has not been fulfilled.

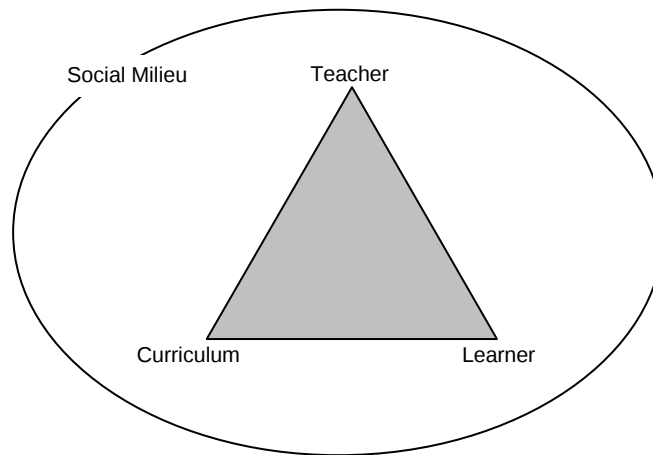


Figure 2.5: Graphical representation of Schwab's (1978) commonplaces of educating.

Model of Commonplace Interaction Groups

By uniting the perspectives of the knowledge, skills, and dispositions that were necessary for the participants in this study (teacher capacity), and the entities in which these knowledge, skills, and dispositions took place (commonplaces of educating), a new idea of commonplace interaction groups arose. Each of the factors of teacher capacity, once placed in a category that defines the main interaction of those factors, creates a commonplace interaction group. Table 2.2 illustrates this idea by listing the factors of teacher capacity, and indicating which commonplace that is involved in the process of practicing that specific factor of teacher capacity. Figure 2.6 illustrates the bi-directional interactions between each commonplace.

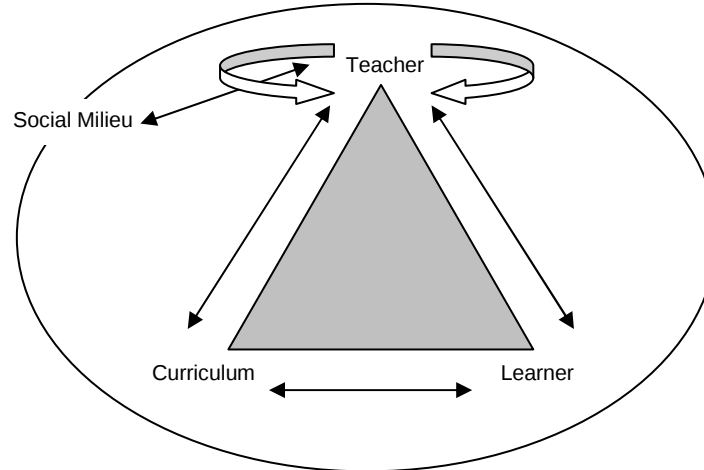


Figure 2.6: Graphical representation of the interactions between each of Schwab's (1978) commonplaces of educating.

It is important to note that Table 2.2 indicates that the teacher commonplace was evident in all factors of teacher capacity. This is because although each commonplace is considered to be equal, it is understood that the teacher is the facilitator to the experience of educating. The teacher is professionally responsible that each of the interactions between the commonplaces takes place successfully. Additionally, in the factors of teacher capacity termed intrapersonal skills, for the purposes of this study, the teacher is the focus of these interactions.

As figure 2.6 illustrates, the teacher not only interacts with the commonplaces of the student, the curriculum, and the social milieu, but they also can interact with themselves as one of the commonplaces. This is often seen in the process of metacognition, or the awareness and understanding of one's own thought process.

Table 2.2: Factors of teacher capacity viewed through the perspective of commonplaces of educating.

Factor	Teacher	Learner	Curriculum	Social Milieu
Intrapersonal Skills	X			
Social Responsibility	X			X
Adaptive Expertise / Context	X			X
Content / Subject Area	X		X	
Curriculum / Standards	X		X	
Pedagogical Content Knowledge	X	X	X	
Models of Teaching	X	X	X	
Pedagogy	X	X		
Interpersonal Skills	X	X		
Knowledge of Students / Learner Diversity	X	X		

Lastly, in the factors of teacher capacity such as pedagogical content knowledge and models of teaching, there are three commonplaces that are marked. This is because in the interaction between students and the curriculum, the teacher was the facilitator, and the teacher guides the information flow between the two entities. The five commonplace interaction groups that were developed from this analysis of educators and educating were: The teacher-self, the teacher-social milieu, the teacher-curriculum, the student-curriculum, and the teacher-student. In summary, the researcher combined two perspectives—the knowledge, skills, and dispositions necessary for teacher capacity, and the interactions that take place during the process of education. This framework of the ten factors of teacher capacity and commonplace interaction groups (Table 2.3) comprised a substantial portion of the framework used in this study. It informed the analysis of

participant data provided a foundation critical reflection and guided the results and conclusions.

Table 2.3: Factors of teacher capacity and commonplace interaction groups.

Interaction Group	Teacher Capacity Factor	Description
Teacher-Self	Intrapersonal Skills	Knowledge of self, having confidence to reflect at higher levels, understanding of oneself and the capacity for introspection and reflection. One's use of material evidence (peer feedback, video, or student work) to inform their practice.
	Social Responsibility	Teaching in a "culturally responsive" way. Making sure those who have been shown to fall behind in standardized tests get the attention and learning that is necessary for them to succeed. In this study includes alternative schools and issues with special needs students
Teacher-Social Milieu	Adaptive Expertise / Context	The ability to acknowledge and make decisions within the rapidly changing environment in which one works, and to be resilient, flexible, and able to maneuver around and within this environment. Also includes acceptance of ambiguity and time management. Growth as a professional
	Content / Subject Area	The subject matter that one is teaching. For the uses of this study, the subject matter consists of chemistry, biology, earth sciences, and physical science.
Teacher-Curriculum	Curriculum / Standards	The scope and sequence of the content material one is expected to teach within the year, and the national, state, and local standards which set objectives for this material being covered.
	Pedagogical Content Knowledge	Knowledge about how learner's think, the influence of instruction on learning, as well as the best way to teach content to a learner.
Student-Curriculum	Constructivism / inquiry	Constructivism (constructing meaning with learners) and/or inquiry learning and teaching, (students are presented with experiences that encourage them to ask questions and conduct their own research).
	Pedagogy	General teaching skills that are applicable to any subject. The art or science of teaching.
	Interpersonal Skills	The ability to communicate with others; or "people skills", and thinking in an ever expanding scope of professional community
Teacher-Student	Knowledge of Students / Learner Diversity	Knowledge and appreciation of students' cognitive differences (diversity in personality and learning styles), and empirical differences (ethnicity, nationality, religion, sexual preference, physical features, individual life choices, cultural factors, or body image. Includes making the effort to get to know students outside the classroom.

Critical Reflection

The process of critical reflection has its origins within the context of reflection, and is supported by several related ideas. Reflective thinking, reflective teaching, and learning to reflect are crucial in one's understanding of critical reflection. This section addresses the development of reflection based on theoretical and empirical research in the field of education. Next, the author addresses the different views of the orientations of reflection, how one learns to reflect. Finally, the framework used to code the reflective passages for each participant in this study is presented. Figure 2.7 illustrates the structure of this section.

Reflective Thinking

In the late 1800's, John Dewey began writing about reflective thinking. In his early attempt to describe this type of meaningful thinking, he illustrates the most basic understanding of the concept.

When one reflects, it is not an act of the senses. One does not reflect by seeing, smelling, hearing, tasting, or touching, although our eyes and ears are consciously involved in receiving information that will later assist us in reflecting. One does not reflect by simply stating their beliefs, which are based on emotions. Reflection, this better way of thinking, is based on intellect and practicality (1897, pp. 7-8).

Our stream of consciousness, an uncontrolled, automatic and unregulated coursing of ideas through our heads (Dewey, 1897, p. 4), is not an example of this best way of thinking. A better way of thinking is "the kind of thinking that consists in turning a subject over in the mind and giving it serious and consecutive consideration" (1897, p. 3). There are many thoughts in one's head, and according to John Dewey, few of them are

actually productive towards reflective thought. Reflective thinking must lead to an end; it must be a consecutive ordering of thoughts leading to a conclusion, which has relevance in the world outside of one's thinking.

Dewey stated that ultimately, there are three criteria by which to guide one's understanding and definition of reflective thinking. First, there must be a causal function within the reflection whereby one thing signifies or indicates another. Second, the end result of reflective thought must suggest or negate something through evidence or proof. Third, reflective thinking must include a desire for resolution (Dewey, 1897).

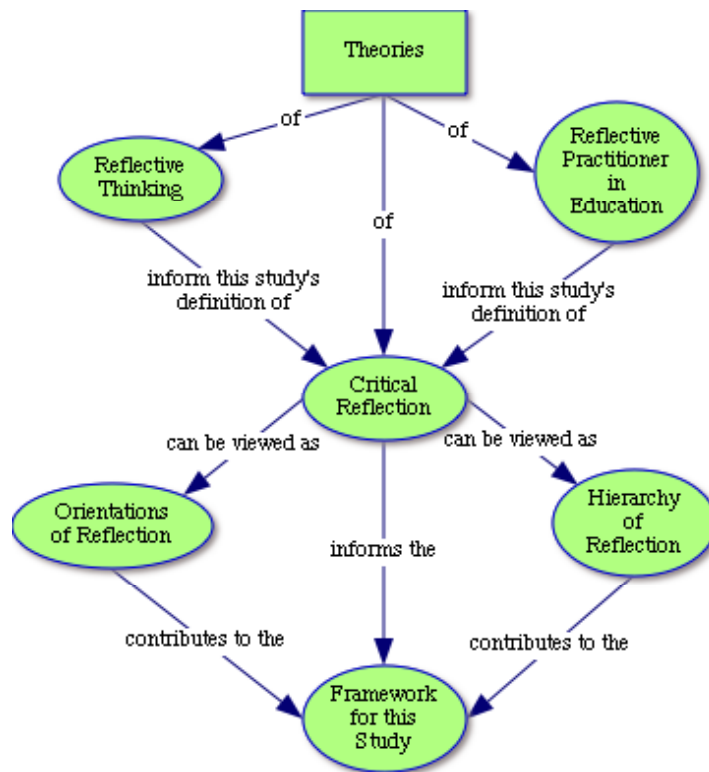


Figure 2.7: Concept map of how theoretical and empirical work contributed to one framework that is used in this study.

Cognitively, there are two steps he described that take place in the process of reflective thinking:

1. A state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates.
2. An act of searching, hunting, inquiring, to find material that will resolve the doubt, settle and dispose of the perplexity.

This dual process of doubt or perplexity and searching or inquiring to find a resolution is common to us—we do this whenever we are faced with a conflict to which we do not know the answer. However, by deliberately going through this process—for the purpose of improving our professional practice, and addressing a situation in which there is doubt and hesitation, and reaching resolution by searching for material to settle this doubt, we are, in essence, being reflective practitioners. Because we are unique as individuals, it is important to remember that there are a myriad of ways that we will respond to any given conflict and then reflect upon it.

The Reflective Practitioner in Education

The idea of the “Reflective Practitioner” gained significant attention with the work of Donald Schön in the mid-1980’s. In Schön’s observations, he believed a change was needed in the practice of training professionals. The major epistemology that was most commonly practiced during this time was called Technical Rationality, and this epistemology was related to Zeichner’s social efficiency tradition. Technical rationality involved professional problem solving that was regulated by scientific theory and technique (Schön, 1983). Within this epistemology of practice, knowledge was only handed down from researcher to practitioner. Unfortunately, there were many questions

not able to be answered within this paradigm and thus a great number of unsolved problems in education.

The difficulty with technical rationality is; “when a practitioner recognizes a situation as unique, she cannot handle it solely by applying theories or techniques derived from her store of professional knowledge” (Schön, 1987 p. 6). There is a skill that is performed in the moment, based on implied understandings, recognitions, and judgments. This way of knowing in the midst of one’s action describes that which is not sensed, and is difficult to name (Schön, 1987). His work involving reflective practitioners not only marks a shift in the dominant epistemology, but also creates the foundation upon which our current understanding of educating the reflective practitioner is built.

Schön proposed three types of reflective thinking in the practice educating the reflective practitioner: Technical rationality, which was described above, in which a practitioner compares their practice to a known authority on the issue, such as a textbook, well-known idea in the field, or in the case of this study, cooperating teacher. Reflection-on-action involves the “ordered, deliberate, and systematic application of logic to a problem in order to resolve it” (Russell & Munby, 1991, p. 165). Lastly, Schön defined reflection-in-action, that which relies on tacit recognitions, is not sensed, and difficult to name. Reflection-in-action is a process with “nonlogical features, a process that is prompted by experience and over which we have limited control” (Russell & Munby, 1999, p. 164). Schön gives the example of a teacher experiencing reflection-in-action in response to needing to explain a concept to a class, and not all of them understand. The

teacher must practice “reframing” (Schön, 1991) and experience the concept differently to be able to explain it differently to the students who do not understand.

It is important to note that although Schön’s work discusses the need to move away from technical rationality as the dominant epistemology, technical rationality still has its usefulness in developing reflective practitioners. Hatton and Smith (1995) include this as an important part in the process of educating reflective teachers. A pilot to this study (Krim, 2007) polled 13 secondary science pre-service teachers in their methods class about which type of reflection was most important, listing the types of reflection by increasing order of complexity; technical rationality, reflection-on-action, and reflection-in-action. The participants in this poll (secondary science pre-service teachers in the methods semester) rated technical rationality as the most important in the teaching process, reflection-on-action second, and reflection-in-action as least important. It is the belief of the researcher that the participants in this particular survey were at a developmental stage where it made more sense for them to attempt to match their practice to a model, rather than trusting their own practice, and developing their professional skills by using their limited experiences as teachers.

In summary, Schön’s view of technical rationality, reflection-on-action, and reflection-in-action created a stable foundation on which to build this study’s current understanding of critical reflection. Schön encouraged educational researchers to question if there was something more than pre-ordained techniques and theories in professional learning, and as a result, he helped to advance the understanding of developing a reflective practice.

Hierarchy of Reflection

Hatton and Smith (1995) further developed Schön's work within the context of teacher education. In their article entitled "Reflection in teacher education: Towards definition and implementation," they distinguish the dynamic natures that can be identified within each of Schön's categories of educating the reflective practitioner.

The purpose of identifying each of these natures of reflection was to make the teaching of how to be reflective more appropriate to the concerns of how to prepare secondary teachers in Australia. The seven issues addressed are:

1. The development in student teachers of a personal style and philosophy of teaching, including ethical dimensions.
2. The use of action research or enquiry-based approaches to investigate and improve teaching in a supportive environment.
3. Recognition of the problematic nature of schooling, including classroom and curriculum decision-making.
4. Sensitivity to contexts for teaching, and in particular, to the range of school students' backgrounds, abilities, and characteristics.
5. Building cycles involving preparation for practicum action, data collection about what happened, reflection upon it, and possible modification.
6. Ongoing monitoring of program implementation, with careful attempts to provide some evidence of their outcomes and impact.
7. Use of techniques such as microteaching to build a repertoire of skills, journaling to encourage recording, thinking, and self-evaluation, and

regular dialogues with peers, staff, and/or teachers to clarify issues and value positions.

By reviewing the areas of concern that are addressed by Hatton and Smith's framework for reflection, one can easily understand and appreciate the contemporary view that educational researchers have of reflection. Hatton and Smith's study, in particular, greatly influenced the researcher's thinking about critical reflection and its role among the pre-service population, and it is the author's understanding that reflection can be a way to address several, if not all concerns of what secondary science pre-service teachers should know, be able to do, and believe.

Hatton and Smith's "natures of reflection", and the possible content that can be addressed by these types of reflection are fundamental to the theoretical framework of this study and are summarized in Table 2.4. The technical nature of reflection is the most basic form of reflection. It is a practice that builds theories from the "method of controlled experiment" (Schön, 1987, p. 78). In the methods classroom, as pre-service teacher begin to address their practice, they most often compare it to ideals of theory that they have learned during their program.

The descriptive nature of reflection-on-action involves the attainment of the best possible practice, and for pre-service teachers to provide a rationale for why they chose to take the approach or actions that they did. This type of reflection can be recorded in a personal journal or essay that can be written after the activity.

The dialogic nature of reflection-on action about one's own teaching is to reflect individually and with others. One way to do this is to videotape the pre-service teacher

and include the viewing of the videotape as part of the teaching assignment, or to have a conversation with one's peers about their experience during the lesson as 'students.' By having a prompt such as a video, or peer feedback, one is able to explore alternative solutions to situations that may not have met their expectations, or the expectations of the assignment.

Table 2.4: Hatton and Smith's adaptation of Schön's model of the reflective practitioner, specific to teacher education.

Reflection type	Nature of reflection	Possible content
'Reflection-in-action' (Schön, 1983, 1987) addressing IMPACT concerns after some experience in the profession	5. Contextualization of multiple viewpoints drawing on any of the possibilities 1-4 below applied to situations as they are actually taking place	Dealing with on-the-spot professional problems as they arise (thinking can be recalled and then shared with others later)
	4. Critical (social reconstructionist), seeing as problematic, according to ethical criteria, the goals and practices of one's profession	Thinking about the effects upon others of one's actions, taking account of social, political and/or cultural forces (can be shared)
	3. Dialogic (deliberative, cognitive, narrative) weighing and competing claims and viewpoints, and then exploring alternative solutions	Hearing one's own voice (alone or with another) exploring alternative ways to solve problems in a professional situation
Reflection-on-action (Schön, 1983; Smith & Lovat, 1990; Smith & Hatton, 1992, 1993) addressing TASK and IMPACT concerns in the later stages of a pre-service program	2. Descriptive (social efficiency, developmental, personalistic), seeking what is seen as 'best possible' practice	Analysing one's own performance in the professional role (probably alone), giving reasons for actions taken
Technical rationality (Schön, 1983; Shulman, 1988; Van Manen, 1977), addressing SELF and TASK concerns early in a program, which prepares individuals for entry into a profession.	1. Technical (decision-making about immediate behaviours or skills), drawn from a given research/theory base, but always interpreted in light of personal worries and previous experience	Beginning to examine (usually with peers) one's use of essential skills or generic competencies as often applied in controlled, small scale settings.

The critical nature of reflecting-on-action is the process of pre-service teachers considering their ethics in the critical sense, a process in which one thinks about what effects their actions have upon others, including fairness and equity in the social, political, or cultural realm. The critical nature of reflection, or critical reflection will

continue to be addressed throughout this section, and the researcher's perspective of the definition and importance of critical reflection will be made clear throughout this chapter.

The last type of reflection that is addressed in Hatton and Smith's framework is reflection-in-action, or the type of reflection that is done in the moment of teaching. In this type of reflection, a pre-service teacher deals with problems in the moment (Hatton & Smith, 1995; Schön, 1987). To do this, pre-service teachers must be able to contextualize multiple viewpoints. This ability is representative of a developmental stage, and it is for this reason that Hatton and Smith, and Schön, view this type of reflection as the highest, and most complex. As was mentioned previously, reflection-in-action is "the conscious use of research-based theories and techniques, that is dependent on tacit recognitions, judgments, and skillful performances, and it is the kind of artistry that good teachers in their everyday work often display" (Schön, 1991).

Orientations of Reflection

Another perspective about reflection among pre-service teachers that influences this study was proposed by Valli (1997) and includes five orientations of reflection that are applicable and pertinent to secondary pre-service teachers (see Table 2.5). Upon first glance, some of these orientations bear an almost identical resemblance to the "natures" of reflection previously proposed by Hatton and Smith (1995). However, there are three important differences to address in Valli's model: the question of hierarchy between categories of reflection, the combination of previously separate categories, and her regard for critical reflection.

First, from a review of the reflective thinking literature, Valli proposed that each orientation has shortcomings in the content as well as the quality of reflection that was being conducted. Valli emphasized that a mixture of each orientation is necessary in training pre-service teachers, and it is more relevant than the practice of valuing one orientation of reflection over another, as proposed by Hatton and Smith.

Table 2.5: Valli's five orientations of reflection.

Type	Content for Reflection	Quality of Reflection
Technical Reflection	General instruction and management behaviors that are based on research on teaching	Matching one's own performance to external guidelines
Reflection-in and on-Action	One's own personal teaching performance	Basing decisions on one's own unique situation
Deliberative Reflection	A whole range of teaching concerns, including students, the curriculum, instructional strategies, the rules and organization of the classroom	Weighing competing viewpoints and research findings
Personalistic Reflection	One's own personal growth and relationships with students	Listening to and trusting one's own inner voice and the voices of others
Critical Reflection	The social, moral and political dimensions of schooling	Judging the goals and purposes of schooling in light of ethical criteria such as social justice and equality of opportunity

Second, in Valli's orientations of reflection, she combines Schön's categories of "reflection-on-action" and "reflection-in-action" into one orientation. The reason why was not clear, was not directly addressed in the article. The third difference in Valli's perspective is that she defines both personalistic and critical reflection as narrow types of reflection focusing on one specific area. Personalistic reflection focuses on the pre-service teacher's relationships with others, and critical reflection focuses strictly on the social and ethical aspect of one's teaching.

The Reflection Framework for this Study

In this study, the researcher combined the perspectives of both Hatton and Smith (1995) and Valli (1997) to construct a framework by which to code passages that were selected from various data sources. The researcher relied on both perspectives of critical reflection with special recognition of Valli's emphasis on employing all types of reflection with secondary science pre-service teachers, "technical reflection is still a dominant mode of teacher preparation in the United States" (Valli, 1997, p. 79).

In developing the framework for this study, the researcher chose to combine both Hatton and Smith and Valli's perspectives. The five categories of reflection are almost identical to Valli's five orientations of reflection. However, each of these orientations is placed in a hierarchy, as illustrated by Table 2.6. In this framework, technical reflection and personalistic reflection are placed in the "low" category. The researcher chose to do this because in her observations and experience as a methods instructor and university supervisor for student teachers, she has seen that these two orientations of reflection are the easiest and most commonly reflected upon by methods students and student teachers. They are challenged to reflect in the "mid" and "high" category – this does not come as easily to them.

The researcher placed Valli's categories of critical reflection and reflection-in and on-action in the "high" category for two reasons. First, reflection-in-action is the highest form of reflection *during* the act of teaching. However, if one is to be a part of the "culture of evidence" as is suggested by McDiarmid & Clevenger-Bright (2008, p. 148), it is most important to provide actual evidence.

Table 2.6: Framework that was used in this study to code reflective passages for reflection type. Adapted from Valli (1997) and Hatton & Smith (1995).

Type	Dominant voice	Knowledge content for reflection	Quality of reflection	Source	Purpose
Critical Reflection	Teacher and others	Social Justice, Learner Diversity, any shift in their point of view.	The ability to consider the social, moral, and political dimensions of schooling, social and political issues	Using outside evidence (peer feedback, video, student work) to modify teaching practice.	To apply ethical criteria to the goals and processes of schooling. Judging the goals and purposes of schooling in light of ethical criteria such as social justice and equality of opportunity;
High Reflection-in and on-Action	Teacher	Anything - A whole range of teaching concerns, including students, the curriculum, and instructional strategies, the rules and organization of the classroom	Judged by their ability to make and justify good decisions based on one's own unique situation.	The teacher's beliefs, classroom context, and students.	To reflect upon one's own personal performance as an educator during (spontaneous, intuitive decisions made during the act of teaching), and after a lesson, or learning experience. And judge it based on their own unique situation, or experience.
Mid Deliberative Reflection	Varies	Anything - A whole range of teaching concerns, including students, the curriculum, and instructional strategies, the rules and organization of the classroom	Judged by the teacher's ability to weigh these competing claims and to give a good reason for the decisions they make.	Research, experience, the advice of other teachers, personal beliefs and values.	To develop one's teaching practice based on theories. These theories can be built from their own experience.

Table 2.6 continued

	Personalistic Reflection	Teacher and others	Inter-personal skills, communication.	What kind of person they want to be, and how being a teacher helps them accomplish their life goals. Concern about their students as a whole. Consciously linking their personal and professional lives.	Listening to and trusting one's own inner voice and the voices of others.	Personal growth, relationships with students, relational and personal fulfillment issues,
Low	Technical Reflection	Outside expert researcher	Pedagogy	Judged by the ability to match their performance to the outside expert.	Cooperating teacher's discussion or behavior, research.	Knowledge transmission

From what the researcher found, there is no current method that has yet been suggested about how to collect evidence of reflection-in-action that is not in the past. For example, a pre-service teacher could reflect-in-action, but how they evidence this fact is by reflecting *on* their action. For this reason, the researcher viewed critical reflection as the highest orientation of reflection. Secondly, the researcher's definition of critical reflection not only includes pre-service teachers thinking critically about the social and ethical domains of their practice, but that the pre-service teacher acknowledges that they are a part of those social and ethical domains, and as such, there may be biases that they are not aware of. Every area of their professional lives may be impacted by these biases.

Learning to Develop a Critically Reflective Practice

It has been established in the previous sections of "Hierarchy of Reflection" and "Orientations of Reflection" that reflection can be used with secondary science pre-

service teachers. In this section the importance of reflection in the pre-service curriculum, the need for pre-service teachers to address problems within their practice and how practicing this study's perspective of critical reflection can answer this need is described. Finally an example of how to teach a pre-service teacher to reflect is proposed.

The Importance of Reflection in the Pre-Service Curriculum

In learning to develop critically reflective practice, secondary science pre-service teachers must learn how to reflect in all orientations. In this study, the participants enroll in a methods class, clinical field experience, and student teaching, where they engage in activities designed to utilize prior knowledge or experiences in new settings where they are actively engaged with content and methods of practice. However, experience alone is not the key to learning. A teacher must sort through the new information by interacting with others and by themselves, organizing their thoughts about the experiences. It is the responsibility of a teacher education program to help prepare pre-service teachers to learn, to provide a field experience in which they can participate, and to make available opportunities for reflection so that they can process and understand what they have seen during these experiences. (Boud, Keogh, and Walker, 1985). Teacher preparation courses that are focused on critical reflection, such as the methods class and clinical field experience observed in this study, ensure opportunities for pre-service teachers to practice critical reflection prior to their student teaching practicum.

Critical reflection is a type of professional development for pre-service and in-service teachers. It allows the experience of educating to become more personalized and it encourages teachers to address their personal theories about the commonplaces of

educating. As a result, teachers who critically reflect demonstrate improvement in their teaching and their relationships with others.

Critical Reflection is a way for teachers to create a personalized experience of their own practice, and of the institution itself. It is a way for teachers to create organizational change, and to make the educational institution less bureaucratic. It is often the case that “the organization seems to assume a life of its own, separate and distinct from the life of its members, and it emerges as an anonymous, depersonalized, and all-powerful collective, accountable to none and subject to no one’s authority” (Osterman & Kottkamp, 1993, p.4). It is a common belief that teaching can be isolating; in most schools, the teacher shuts their door and spends the majority of their day dealing only with students. By involving others in the reflective experience, such as inviting colleagues to contribute peer feedback, this isolation is broken, and the experience of teaching becomes one of collaboration and communication between professionals about best practices to improve teaching and learning.

Critical reflection is best explained by action theories that consist of espoused theories, (those that we speak), and theories-in-use, which are so deeply engrained in our subconscious that we may not be aware of them. Critical reflection encourages us to recognize and address these theories-in-use. “Since teaching depends to a large degree on how a person sees, acts, and lives, one could argue that the development of dispositions and ethics is very important in teacher education. It is, however, such a neglected part of teacher education as to be almost nonexistent” (Collinson, 1996, p. 7). Schwab’s (1978) commonplaces of educating reminds us that the teacher exists inside the social milieu,

and as part of this environment, there are espoused theories and theories-in-use that teachers need to be made aware of. When teachers recognize these theories, they are able to better address the needs of all students in their classroom. Critical reflection, as defined by this study, encourages pre-service teachers to examine their espoused theories and theories-in-use in a critical way.

When an individual begins to practice critical reflection, their teaching and their relationships with others improves. “In my experience as a teacher and my recent research has led me to believe that unless teachers have had many opportunities to practice interpersonal skills and receive critical feedback, mature behavior and relationships cannot be assumed” (Collinson, 1996, p.6). The process of accepting critical feedback encourages one to grow and develop both as a teacher and in their personal lives. By teaching pre-service educators to develop a critically reflective practice, teacher educators not only improve the quality of teachers but also help ensure that education graduates will also have a better quality of professional relationships with others.

Developing a critically reflective practice can be beneficial to secondary science pre-service teachers in several ways. Critical reflection encourages professional growth. In learning to be critically reflective, one is expected to trust other’s voices, and also to trust their own voice. It is important for teachers and teacher educators alike to recognize the need for a critically reflective community. “Helping individual teachers become reflective is not sufficient. Schools must have reflective cultures. If left unsocialized, individual reflection can close in on itself, producing detached, idiosyncratic teachers” (Valli, 1996, p. 86). Teacher educators must be sensitive to pre-service teachers’ needs,

and encourage and facilitate pre-service teachers to be prepared to work towards the building of a supportive community within their cohort.

The Role of Critical Reflection in Addressing Problems

Teacher education programs need to present problems to pre-service teachers and encourage ways of thinking about the problems with pre-service teachers. In addition, it is important to provide opportunities for these pre-service teachers to practice this skill. Critical reflection, in this study, is the process of addressing aspects of one's practice as a problem – Asking questions such as: What do outside experts (one's fellow educators or one's students) have to say about this pre-service teacher's practice? What did the pre-service teacher mean to do, and what did they do? What possible bias can be found among social and ethical boundaries in this pre-service teacher's classroom? By developing a critically reflective practice about one's professional knowledge, skills, and dispositions, the researcher believes that secondary science pre-service teachers will be prepared to look for and address critical problems related to their practice.

Critically reflective practice provides autonomy and independence for secondary science pre-service teachers as well as opportunities for collaboration, communication, and community-building among professionals. In addition, critical reflection is a mechanism by which a teacher can ensure they are meeting the qualifications mandated by national and state standards, professional development organizations, and overarching governmental policies.

Teaching Reflection: A Possible Model

The manner in which one reflects, as well as the content about which one reflects, is specific and individual to each pre-service teacher. However, it is important to have guidelines to facilitate the process of teaching reflection to secondary science pre-service teachers. One approach, “case records” has been found to be effective in promoting reflection among educators (Osterman and Kottkamp, 1993). A case record is a piece of writing produced by the person who is reflecting and it is comprised of answers to several prompting questions. This approach is similar to prompted journaling or response journaling. By answering each of the questions, the person who is creating a case record, or responding to journal questions, is able to consider and evaluate their thoughts in a systematic way. To create a case record, Osterman & Kottkamp recommend answering the following questions:

1. The Problem - Who was involved? What was the pertinent background information? What was your role in the problem?
2. Outcome / Objectives Desired - What did you hope to accomplish?
3. Alternatives Considered - What alternatives did you consider to solve the problem?
4. Strategies Implemented - What action did you take in an attempt to achieve your objectives?
5. Results - Were your objectives achieved? What happened as a result of your actions?

6. Assessment - Did your plan work as intended? What critical events, decisions, situations influenced the outcome? What would you do differently, if anything?

The deliberative practice of thinking about and writing out each step of this reflective process with a provided list of questions creates a pathway for pre-service teachers who are developing a reflective practice. It is particularly important to those who teach pre-service classes to use structured journals or response journals when beginning to teach reflective skills. The list provided by Hatton & Smith not only proves useful to those reflecting, but also to those who are assessing the reflective capabilities of pre-service teachers.

In this study, response journals are used in the clinical field experience during the methods semester. In the student teaching semester, participants are expected to keep a type of “free writing” journal. This process provides an open-ended template and is not regulated by instructions as to how, when, and why to reflect, but it leaves this choice up to the person who is reflecting.

In summary, the definition of critically reflective practice that is used for the purposes of this study is: the viewing of the social and ethical implications of one’s practice, the understanding that one is part of the social environment in which they are teaching, and the use of evidence provided by sources outside oneself, such as peer feedback, video, and student work to inform one’s practice.

Developing a critically reflective practice takes time. It is important for secondary-science pre-service teachers to practice all orientations of reflection, and build

their knowledge, skills, and dispositions toward the practice of critical reflection. This is not only necessary during the methods semester, when pre-service teachers (in this study) take a methods class and participate in a clinical field experience, but it was also necessary during the student teaching semester, when these participants were building their experiential knowledge. Research has shown that with mentoring of reflective practice, “new teachers become more self-evaluative and critically reflective” (Harrison, Lawson, & Wortley, 2005, p.1). As a result of developing a critically reflective practice in pre-service teachers, it is possible that positive secondary and unexpected outcomes such as improved student learning may be realized. Further research is needed in this area of educational assessment and measurement.

Current Literature

In the early stages of developing the research design for this study, the author reviewed the existing body of literature about reflection, secondary science, and pre-service teachers. It is important to emphasize that the combination of the three areas of pre-service, secondary science, and reflection is not well addressed in the educational literature. By identifying research that addressed two of the three main conceptual ideas for example pre-service and secondary science but not reflection the researcher was better able to review and critique the common data acquisition methods being used in this research area.

The research that was reviewed in the area of pre-service teachers and reflection included: Bain, Ballantyne, Packer, & Mills (1999), who collected data in the form of

reflective interviews and reflective journals or diaries, and Good & Whang (2002), who collected data in the form of response journals. The research in the area of science teachers and reflection was McGregor and Gunter (2006), who collected data in the form of reflective interviews, and collective reflection, peer feedback, group discussion, or Internet collaboration. The research that was reviewed in the area of secondary science teachers and reflection was that of Danielowich (2006), who collected data in a variety of forms: reflective interviews; collective reflection, peer feedback, group discussion, or Internet collaborations; response journals; observations, researcher notes, or field notes; and videotaped lessons. The research that were reviewed in the area of pre-service and science and reflection were: MaKinster, Barab, Harwood, and Anderson (2006), who collected data by means of collective reflection, peer feedback, group discussion, or internet communities, as well as reflective journals or diaries, MacIsaac, Sawada, and Falconer (2001), who collected data in the same way as MaKinster et al., but added the data source of videotaped lessons to their study, and Ramsey (2001), who collected data in the form of collective reflection, peer feedback, group discussion, or internet communities, as well as response journals. Finally, the author reviewed work by Chin & Tuan (2000) who studied secondary science pre-service teachers and their reflection. The data acquisition methods used by Chin & Tuan were: reflective interviews, reflective journals or diaries, and observations, researcher notes, or field notes.

Table 2.7: Table illustrating the key research that has been conducted in this area with similar populations and similar methods. The areas of data acquisition that will be addressed in this study are marked with “XXX”.

Data Acquisition Methods	Pre-service	Science	Secondary Science	Pre-service Science	Secondary Science Pre-service
Reflective Interviews	Ballantyne et al., (1999), Freese, (1999)	McGregor & Gunter, (2006)	Danielowich, (2006)		Chin & Tuan, (2000)
Collective Reflection, Peer Feedback, Group Discussion, also on "web"	Eick and Diaz, (2005)	McGregor & Gunter, (2006)	Danielowich, (2006)	MaKinster et al., (2006) MacIsaac et al., (2001) Ramsey, (2001)	XXX
Response Journals	Good & Whang, (2002)		Danielowich, (2006)	Ramsey, 2001	XXX
Reflective Journals or Diaries	Ballantyne et al., (1999)			MacIsaac et al., (2001) MaKinster et al., (2006)	Chin & Tuan, (2000)
Observations, Researcher Notes, Field Notes			Danielowich, (2006)		Chin & Tuan, (2000)
Videotaped Lessons			Danielowich, (2006)	MacIsaac et al., (2001)	XXX

Table 2.7 illustrates the comparison between data acquisition methods and the participants that were studied. The researcher found that there were several methods of data acquisition that have not been utilized with the secondary science pre-service teacher population. In response to this need, this study addressed all of the data acquisition methods named in this table, and by doing this, filled several gaps in the methods of acquiring data in the area of secondary science pre-service teachers. These areas were marked with “XXX” in Table 2.7.

In this study, the data acquisition methods that are implemented during the methods semester are: reflective interviews, collective reflection, peer feedback, and group discussion, response journals, observations, researcher notes, and field notes, and

videotaped lessons. The data acquisition methods that are implemented during the student teaching semester are: reflective interviews, reflective journals or diaries, observations, researcher notes, and field notes, and videotaped lessons.

Summary

Our current understanding of what a teacher should know, be able to do, and believe is described by the term teacher capacity. For the purposes of this study, teacher capacity is meant to describe the compilation of ten key factors: pedagogy, Content / Subject Area, curriculum / standards, pedagogical content knowledge, interpersonal, intrapersonal / self, knowledge of students / diverse learners, growth / adaptive expertise, constructivism / inquiry, and social responsibility / context.

The commonplaces of educating represent the entities that teachers interact with in their professional life. The new adaptation of commonplace interaction groups that was developed for this study; teacher-self, teacher-student, teacher-curriculum, teacher-social milieu, and student-curriculum can exist as a framework with which to view the factors of teacher capacity in this study. In addition, the commonplaces of education illustrate that teachers, students, and curriculum are all part of the social milieu in which education takes place. This perspective contributes to the definition of critical reflection that is used for the purposes of this study.

Developing a critically reflective practice is important for the success of secondary science pre-service teachers. For the purposes of this study, this means: the viewing of the social and ethical implications of one's practice, the understanding that

one is part of the social environment in which they are teaching, and the use of evidence provided by sources outside oneself, such as peer feedback, video, and student work to inform one's practice.

This study incorporates a combination of data acquisition methods that has not yet been implemented with the secondary science pre-service teacher population in the area of critical reflection. By collecting data from reflective interviews, collective reflection, peer feedback, group discussion, response journals, reflective journals or diaries, observations, researcher notes, field notes, and videotaped lessons, it is the researcher's hope that this study will provide a deeper and more detailed description of the development of critical reflection and teacher capacity in secondary science pre-service teacher preparation.

This chapter addressed the recent theoretical and empirical literary works that build the theoretical foundation of this study, which attempts to answer the question: How does critical reflection inform teacher capacity within the secondary science pre-service teacher population?

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This study is based on case study research methodology and attempts to answer two research focus questions: How does critical reflection inform teacher capacity within the selected secondary science pre-service teacher population? What knowledge, skills, and dispositions do prospective educators need in order to develop a critically reflective practice? This research case study methodology provides depth and detail through a variety of data acquisition methods. Interviews and video data of teaching experiences, and participant work samples help create a story about each of the research study participants, describing their development of a critically reflective practice.

This chapter begins with a discussion of case study design, in which the constructivist and sociological natures of this case study are presented. Next, the researcher discusses her role in this study, the context in which the study took place, how the participants were selected, and the research questions that guided the design of the study. This discussion is followed by an explanation of the timeframe in which the study took place, and a discussion of the data acquisition methods and data analysis, including the instruments that were used for the data analysis. Finally, the researcher discusses the validity and limitations of this study.

Case Study Research and Design

This study was designed to increase our understanding about how secondary science pre-service teachers developed a critically reflective practice. In the process of conducting each of the cases within this study, the researcher focused primarily on the participant's view of their pre-service teacher education experience and multiple perspectives of several key individuals who had significant insight on the research subjects' professional progress. Analysis of the results is based on an adaptation of Schwab's (1973) commonplaces of educating, especially as it emphasized the teacher as part of the constructs of society and socialization. In this section of the chapter, the researcher describes social constructivism as an educative worldview and the sociological case study approach.

Creswell (2007) refers to social constructivism as a worldview, and defines research done within this worldview to be representative of the following criteria:

1. Individuals seek an understanding of the world in which they interact.
2. Individuals seek meaning of their experiences, and as individuals, the meanings that are sought are as unique as the individuals themselves.
3. The researcher understands that it is the complexity of views that holds importance, rather than the narrowing of these ideas into easily compartmentalized concepts.
4. The goal is to rely as much as possible on the participants' views of the situation.

This study investigated the development of knowledge, skills, and dispositions of secondary science pre-service teachers as they developed a critically reflective practice. The researcher incorporated each of Creswell's criteria for conducting research within the social constructivist worldview into the design of this study.

Primarily, as Creswell suggests, the researcher sought an understanding of the world in which she interacted. Because the researcher was a graduate teaching assistant and a university supervisor in the classes in which the participants had enrolled, there were many questions that arose about this population and how they learned. The researcher taught, mentored, counseled, and graded the work of these participants, and developed this study to answer her questions about how this population developed a critically reflective practice.

Second, because Creswell recommends that it is important to remember that the meanings that are sought are unique unto the individual, the researcher understood that it was important to celebrate the individuality of each of the participants in this study, and to give merit to the meanings constructed by each of the participants; in other words, the participants' view provided value to the research. The researcher developed an individual profile of each participant. In addition, Creswell's idea of "complexity of views" was considered as the perspectives of several professionals related to the study who had significant insight of each participant: the methods instructor, the university supervisors, cooperating teachers, and students was used in the study to triangulate the data sources of interviews and participant work samples. These perspectives added individuality, depth and detail to the description of each participant within this study.

Lastly, it was a goal of the researcher to rely on the participants' view of their situation as the foundation for each case study. This was done in two ways. First, the researcher provided raw data in an appendix to supplement her presentation of each case. The use of raw data means that the exact words and phrasing used by the participant is presented initially without the researcher's interpretation, allowing the reader to make their own judgments, prior to the presentation of the researcher's own perspective (Stake, 1995). Second, the researcher relied on the participants' view by implementing the practice of member checking (Creswell, 2003). The researcher asked each participant to review the interview transcripts and confirm them for accuracy, thus ensuring the validity of the results of this study. By relying on a variety of complex views, this research effort was guided by the goals of social constructivism to describe how secondary science pre-service teachers used critical reflection to inform their practice.

This research can be classified as a sociological case study, because it "attends to the constructs of society and socialization in studying educational phenomena" (Merriam, 1998, p. 26). As one of the main theoretical frameworks in the design of this study, a critically reflective practice includes the concept of examining the social and ethical implications of one's practice, and understanding that one is part of the social environment in which they are teaching. This part of the researcher's definition of critical reflection originated with Schwab's (1973) commonplaces of educating, in which the teacher, student, and curriculum are all influenced by the social milieu in which educating takes place. This focus on society and socialization in this sociological case study informs discussions of critical reflection and the commonplaces of educating.

In summary, this sociological case study, framed within the worldview of social constructivism, was undertaken to offer an in-depth description and more comprehensive understanding of how secondary science pre-service teachers use critical reflection to inform their practice and strengthen teacher capacity. The research incorporated a variety of perspectives and focused on the participants' understanding of the situation. The study involved participant and researcher acknowledgement and understanding of how society and socialization can (and does) impact one's teaching.

Researcher's Role

The researcher has been involved with science education since 1992, when she began her professional career as a public school educator, teaching eighth, ninth, and tenth grade science classes. While pursuing her doctorate degree, she served as a graduate teaching assistant and instructor for the Methods of Teaching Secondary Science class, and as a university supervisor for the clinical field experience, and student teachers.

During the time of the study, the researcher was the graduate teaching assistant in the participants' methods class, and their university supervisor for field experiences. This role allowed the researcher to spend prolonged time in the field observing the research subjects (Creswell, 2003) relying on participant-observation as a critical data acquisition method (Yin, 1989). Both of these data acquisition methods ensure validity and help insure a detailed and in-depth case study research methodology.

Context

This study took place at a land grant university in a small town in the northern rocky mountain region of the USA. The public university hosts approximately 600 full time faculty and 12,000 students at the undergraduate, certificate, masters, and doctoral level. Two thirds of the students that attend this university are state residents. Founded in 1893 as a unit of the state university system, this university is officially certified as a Carnegie research 1 university, and it is regionally accredited by the Northwest Commission on Colleges and Universities (NWCCU).

The College of Education, Health and Human Development offers programs for career preparation in education as well the health and human development field. The Department of Education has two units. The Curriculum and Instruction unit prepares elementary and secondary teacher education majors, and the Educational Leadership unit offers graduate programs in K-12 teaching, school administration, and adult and higher education. The undergraduate teacher education programs at the secondary level include typical core and elective subjects. Secondary science undergraduate pre-service teachers may choose to pursue one specific subject, such as chemistry, biology, earth sciences, or physics, or to major in a program combining several science domains.

Due to the rural nature of this university's geographic location, there are many schools in which there is only one science teacher. This science teacher must teach all science subjects for the whole school. To accommodate this, the Department of Education offers an option of "Broadfield Program" to secondary pre-service teachers. This degree option provides a basic knowledge of a variety science subjects, such as

biology, chemistry, physics, and earth science. In the broadfield degree program the graduate is certified to teach in any (or all) of these science subjects and thus accommodating the needs of rural schools with one teacher responsible for all grades and all science subjects.

All of the research participants in this study have been undergraduate students at the university and have participated in both the Methods of Teaching Secondary Science (three credits) class and Clinical Field Experience (one credit) concurrently during the semester prior to their Student Teaching Practicum (10-12 credits). Methods of Teaching Secondary Science focuses on lesson and unit planning, teaching, and evaluating science inquiry skills, content knowledge, attitudes, and safety in the secondary classroom. In this class, subjects are taught several methodical and systematic ways to be critically reflective, including the use of concept maps, Gowin's Vee heuristic (1981), teaching and learning styles, video recording of teaching events, peer feedback, and participant work samples. All of these approaches are used as tools to inform their teaching and help develop critically reflective teaching.

Participant Selection

The population of students in the methods class typically averages 10 students per semester thus limiting the range of students to include in the study. The selection of research subjects was influenced by both the small population of the class as well as the restrictions of the study's design. The necessary requirements for participants in this

study was that they represented a typical student in this program of study, that is, research subjects were:

1. Enrolled in both Methods of Teaching Secondary Science and Clinical Field Experience during the methods semester.
2. Enrolled in Student Teaching for the student teaching semester.
3. Planning to student teach in the continental United States.

A preliminary interview was conducted with each of the students in the class who fit this profile. During the preliminary interview, the researcher made note of those students who showed interest in the study, had favorable views about participating, had a schedule that could accommodate the requirements of the study, and demonstrated reliability in the class requirements up to this point. Reliability in class requirements included arriving on time, asking questions about specific assignments outside of class, participating in class, and meaningful feedback to their peers during a student-taught lesson. After the preliminary interview, the researcher invited the subjects to participate in the study and received informed consent to participate for each of the five subjects.

All subjects in this study were Caucasian, in their mid-20's, and all but one were pursuing their first career. There were two male participants (Fred and Michael), and three female participants (Eva, Sarah, and Stephanie). The following description of each participant includes demographic information and a brief excerpt from an anecdotal assignment entitled "Why I want to be a Teacher", which provides some insight into their personality and motivation.

Eva

Eva was a Broadfield Science Major and Biology Teaching Minor. She grew up in a local small town, on a farm. Her family was hardworking and her upbringing involved her participation in many community activities. Eva could be considered a traditional undergraduate student, whose mother and two aunts were public school teachers. While attending classes, she worked part time at an agricultural genetics lab on campus. Also, as an undergraduate Eva participated in an exchange program to the University of Hawaii, Manoa in Honolulu. In Eva's written response to the question "why do you want to be a teacher?" she wrote,

"All through my 22 years my friends, especially my mother, have been hinting towards me becoming a teacher and how natural it would be. Nevertheless, I would just take it as a compliment and think nothing more of it. I suppose I had to experience new fields before I could settle on what I knew in the back of my mind I wanted to do all along."

Eva's clinical field experience concentration was middle school science (sixth grade), and her student teaching practicum concentration was in was in Chemistry and Earth Science a high school near her hometown.

Fred

Fred was a Broadfield General Science and Biology and Environmental Science double major. He grew up out of state in a hard-working middle class family with one older brother. He feels that his parents instilled good morals and values in their children. He grew up in this small town until he was 12, at which time his family moved to a rural small 15-acre farm. A non-traditional student, Fred received his undergraduate degree in Environmental Science / Fish and Wildlife from a school on the east coast of the United

States. He worked for a short period of time in this field and then moved to the location of this study with his wife, in order to complete his certification degree. He was extending this certification over three to four years, while working full time at a local restaurant. In Fred's written response to the question "why do you want to be a teacher?" he wrote,

"My motivation to teach comes from a desire to help others, which is a great quality I have always carried in my heart. I want to be a teacher so I can help guide our youth through education as well as in life. I have been a student in the education system for many years and now I want to give back."

His clinical field experience concentration was in Physical Science at the local high school, and his Student Teaching practicum concentration was in Biology I and Integrated Science, out of state, in a location that was rich in multicultural diversity.

Michael

Michael was Physics and Math Major. At the time of this study, he was enrolled in two methods classes (Science and Math) during the same semester. As a traditional undergraduate student, Michael worked approximately 20 hours a week at various part time jobs, including tutoring Physics and Math to undergraduate students. He also had experience coaching high school football, as a volunteer. In Michael's written response to the question "why do you want to be a teacher?" he wrote,

"I worked as a counselor for the Peaks and Potentials program at the university for two weeks, and I enjoyed the job, especially the interaction with all of the kids. The week after the camp ended, I changed my major to Education with an emphasis in general science broadfield. I wasn't exactly sure why at the time, but it seemed to fit much better than engineering."

His clinical field experience concentration was Algebra and Physics at a local high school, and his student teaching practicum concentration was physics and algebra at an out of state high school that had high expectations for student scores on state test results.

Sarah

Sarah was a Chemistry Major. She grew up in a small town, where her father was a college professor at the local college. Sarah was a traditional undergraduate student. In Sarah's written response to the question "why do you want to be a teacher?" she wrote,

"Teaching is more than giving people information. Learning is more than just reading a book and trying to remember something. My dad showed me that learning could be fun, and if you are the right kind of teacher, learning anything was possible."

Sarah's clinical field experience concentration was in General Chemistry in a local high school, and her student teaching practicum concentration was in General Chemistry at a high school out of town.

Stephanie

Stephanie was a Biology Major, who grew up in a family of six children. She lived in many different geographic places during her childhood. While attending classes, Stephanie worked from 25-30 hours per week at a local restaurant. The summer between her field experience and her student teaching practicum she married and moved out of state for her student teaching semester. In Stephanie's written response to the question "why do you want to be a teacher?" she wrote,

"I believe students are amazing creatures striving to learn and are willing to above and beyond what is expected. Students just need help getting started and as a teacher, I will be there to guide students along their way."

Stephanie's clinical field experience concentration was in General Science at a local alternative high school, and her student teaching practicum concentration was Biology and was done out of state at a prestigious high school.

Originally, there were seven participants. However, in the second semester of this study, two participants did not complete all assignments for their student teaching practicum. As a result, there was no work sample data produced by these participants, and triangulation of the data sources was not possible to complete. As a result, they were dropped from the study.

Research Questions

A thorough review of the education research reveals that critical reflection is an important part of teacher capacity (Valli, 1997, Cochran-Smith, Feiman-Nemser, McIntyre & Demers, 2008). The literature suggests that critical reflection could be a way for pre-service teachers to inform their practice and facilitate their professional capacity. The main focus question (MFQ) that guided the design of this study was:

MFQ: How did critical reflection inform teacher capacity within the secondary science pre-service teacher population?

The following sub-focus questions (SFQ) assisted the researcher in the collection of data:

SFQ₁: What knowledge facilitated secondary science pre-service teachers in developing a critically reflective practice?

SFQ₂: What skills facilitated secondary science pre-service teachers in developing a critically reflective practice?

SFQ₃: What dispositions facilitated secondary science pre-service teachers in developing a critically reflective practice?

Figure 3.1 below illustrates the research design of this study. The researcher collected data from interviews, participant work samples, and observations, and analyzed interview transcripts and participant work samples by coding selected passages for knowledge type and reflection type. Commonalities that were found between these two manners of coding the data are discussed in Chapter Four.

Timeframe

This study took place over 18 months, or over the course of three consecutive semesters. The first set of research subjects (Group I) included; Eva and Michael, and the second set (Group II) included three participants; Fred, Sarah, and Stephanie. Each group was studied for two semesters. The first semester, or “methods semester” took place when the participants were enrolled in the Methods of Teaching Secondary Science class and Clinical Field Experience. The second semester, or “student teaching semester”, took place when the participants were enrolled in the Student Teaching Practicum. These students were studied in two groups because there were only four students who met the prerequisite requirements for participation in the study in the first semester. The study was continued in an effort to gain more participants, providing a more in-depth view of secondary science pre-service teachers. Because there were two separate groups, it was necessary to collect the data from group I and group II at the same time, although group II followed group I by one semester. This worked to the advantage of the researcher,

because improvements in the efficiency of data acquisition were made between semesters, resulting in a more thorough and streamlined manner of data collection. Table 3.1 illustrates the procedures conducted during each timeframe of the study.

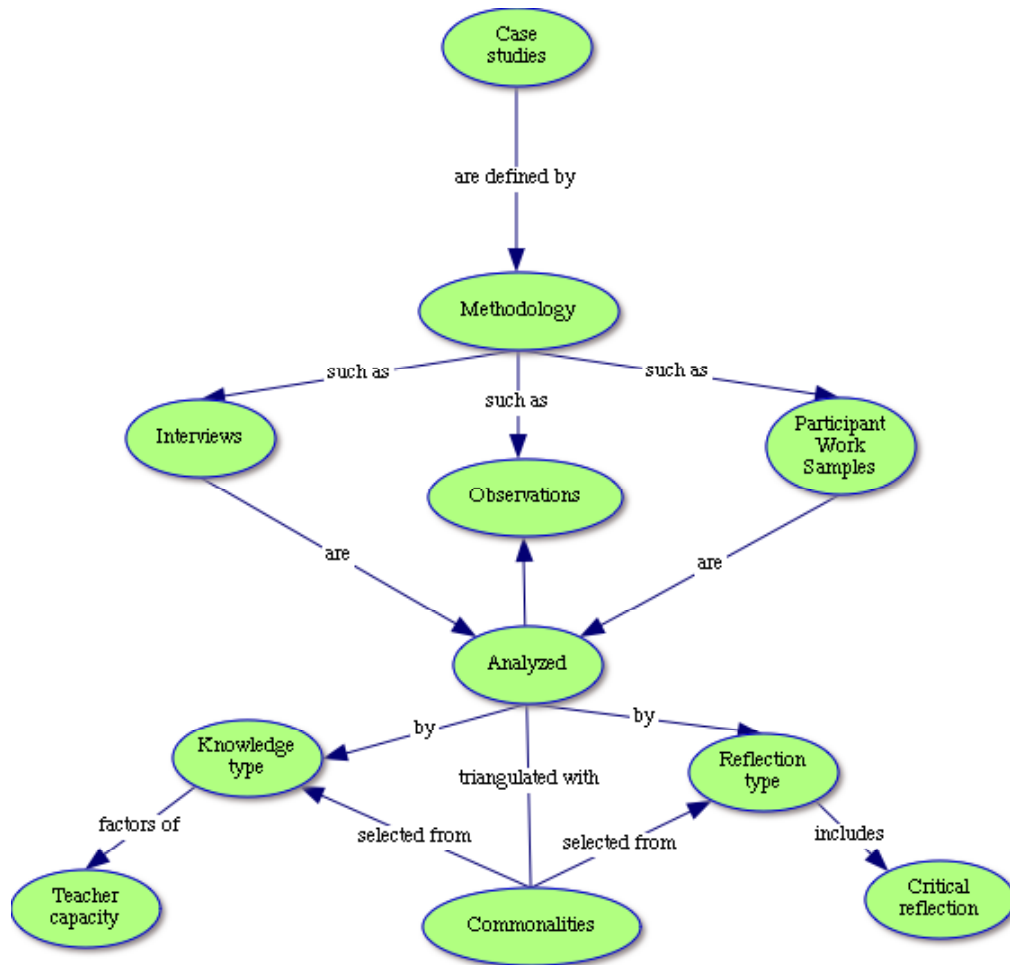


Figure 3.1: Concept map of the design of this study

Table 3.1: Timeframe and procedures for this research study.

	Group I (2 participants)	Group II (3 participants)
Methods Semester for Group I	- Selected and confirmed research participants. - Videotaped lessons taught in EDSD 466. - Observed each participant in class, and made note of information that could be discussed in the upcoming interview. - Collected written data (submitted self-reflections and other assignments) throughout the semester. - Conducted 3-4 interviews, each were scheduled after a large assignment had been completed.	- Preparation for second group which included modification of interview techniques based on experience with group I.
Student Teaching Semester for Group I and Methods Semester for Group II	- Conducted first interview at beginning of semester. - Traveled to student teaching location, videotaped, observed and conducted second interview. - Collected written data (journals and lesson plans) completed up to this point. - Conducted third interview at end of semester. Collected remainder of written data from research participant.	- Selected and confirmed research participants. - Videotaped lessons taught in EDSD 466. - Observed each participant in class, and made note of information that could be discussed in the upcoming interview. - Collected written data (submitted self-reflections and other assignments) throughout the semester. - Conducted 3-4 interviews, each one to be scheduled after a large assignment had been completed.
Student Teaching Semester for Group II		- Conducted first interview at beginning of semester. - Traveled to student teaching location, videotaped, observed and conducted second interview. - Collected written data (journals and lesson plans) completed up to this point. - Conducted third interview at end of semester. Collected remainder of written data from research participant.
	- Data Analysis	

Data Acquisition Methods

As discussed in the previous chapter, this study implemented several data acquisition methods: interviews, participant work samples, and observations. Patton (2002) describes four types of triangulation that can “contribute to verification and validation of qualitative analysis” (p. 557). According to Patton, the Triangulation of Sources involves checking the consistency of different data sources within the same method” (Patton, 2002, p. 556).

By gathering data from interviews, participant work samples, and observations during the methods semester and the student teaching semester, and coding interview transcripts and participant work samples, the researcher was able to find patterns of themes. These patterns of themes were triangulated using the observations of key individuals who have significant insight to each participant. The individuals were: methods instructor, university supervisors, cooperating teachers, and K-12 students during the student teaching semester. Feedback from this stakeholder group was used to validate the outcomes of this study (Creswell, 2003).

The specific data acquisition methods in each of the three main categories for triangulation are listed and described here:

Interviews

Interviews were conducted during both the methods semester and the student teaching semester. During the methods semester, four interviews were conducted, and during the student teaching semester, three interviews were conducted. During the two semesters of which this study took place, an important part of each interview was to incorporate evidence to prompt the participant to reflect. Evidence such as videos of the participant teaching a lesson, student work, and peer feedback was used for interviews in both semesters. The type of reflection in each interview varied, as all orientations of reflection (Valli, 1997) were used.

Methods Semester: During the methods semester, the interviews were conducted after the participant completed each of the four major units required for the methods

class, described in Appendix C. Appendix H is an example of an interview protocol that was used for the methods semester.

Student Teaching Semester: During the student teaching semester, there were three interviews, conducted at the beginning, middle, and end of the student teaching practicum. Due to the participants' geographic location during the student teaching semester, it was not financially feasible to conduct all interviews in person. Instead, the researcher conducted the first and last interviews by phone, and the middle interview in person during a site visit. Appendix I illustrates an example of the interview protocol used during the student teaching semester.

Participant Work Samples

Participant work samples were collected during both the methods semester and the student teaching semester. During the methods semester, the participant work samples that were collected include reflective summaries (Appendix D), self evaluations (Appendix E), and structured journal responses (Appendix F). During the student teaching semester, the participant work samples collected were free writing journal entries (Appendix G).

Reflective Summaries: The reflective summaries written by each participant (Appendix D) accompanied each of the four major units they were required to complete for their methods class. Each of these major units focused on an area of teaching secondary science. The first unit involved a demo and lecture, the second was a lab taught with one or two peers, the third was a one week long unit plan, and the fourth was

a full lesson, referred to as “microteaching”. Each of the lessons that were taught (units one, two, and four) involved an instructor-led peer feedback discussion after the lesson. During this time, the participants would practice reflection-on-action, and the personalistic and technical orientations of reflection as a group (Valli, 1997). After the discussion, participants were expected to review a videotape of their teaching. After completing both the peer feedback discussion and reviewing the videotape of their teaching, participants were required to write a critically reflective summary about their teaching performance, being specifically prompted to address the questions “what went well”, “what did not go well”, and “why”. The reflective summary about the third unit, (a week-long unit plan) was designed to have participants focus on their progress and development while creating the unit plan, and the structure of the reflection they were to use was open ended. The type of reflection chosen by each participant for this work sample varied.

Self Evaluations: The self-evaluation that was examined for each participant was a five-point assignment given to participants in the methods class at the end of the semester (Appendix E). In this assignment, participants were asked to write a critically reflective summary on their performance as a student in the methods class, and specifically prompted with the questions: “What do you feel you have contributed to this class?” and “What could you have done better?”

Structured Journal Responses: During the clinical field experience, participants were asked to respond to eight structured journal questions (Appendix F), focusing on

several issues such as time management, special needs students, motivation, and levels of questioning. These questions addressed the technical and personal orientations of reflection (Valli, 1997).

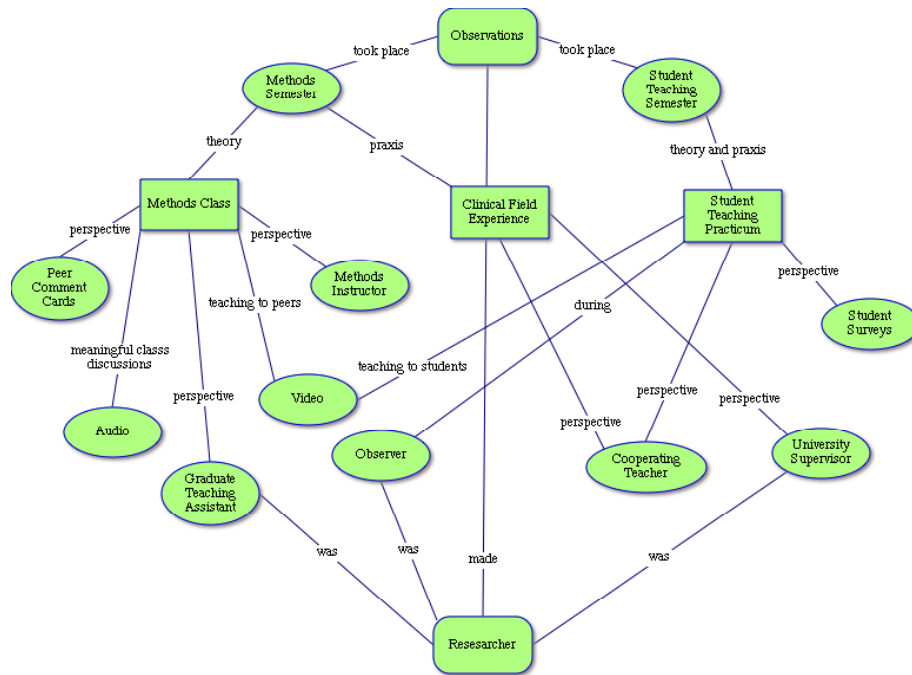


Figure 3.2: Concept map illustrating the various perspectives of observation presented within this study.

Free Writing Journal Entries: During the student teaching semester, participants were expected to keep a daily journal (Appendix G). There were no requirements for the content of this journal, only that it be completed.

In each of these participant work samples; reflective summaries, self-evaluations, structured journal responses, and free writing journal entries, the text of each of these documents was reviewed by the researcher, and coded according to reflection type and factor of teacher capacity.

Observations

A major goal of this study was to involve as many perspectives as possible to provide a well-rounded, in-depth, and detailed view of each of the participants, adding to the validity of this study. Figure 3.2 illustrates the multi-faceted perspectives that were considered in each case study analysis, and Table 3.2 illustrates specific data sources that were collected for each individual participant. The following paragraphs explain how each of these perspectives was implemented in the study, and the context in which they occurred.

Methods Class: During the methods class, several perspectives were considered, to allow the researcher to gain a clear view of what the participant was experiencing. The first perspective that was provided was that of the researcher. The researcher participated in every methods class, either as a Graduate Teaching Assistant, who worked with the participants during their class, as an observer, or as an instructor of the class, while the instructor of record was away. By being a natural part of the class as a graduate teaching assistant, the researcher was able to observe the participants in an unobtrusive manner.

The second perspective that the researcher used was that of the methods instructor. Several times during the semester, the researcher would meet with the methods instructor to discuss his observations of participants within the study. During each of these meetings, the researcher was able to confirm or discount what she was observing with each of the participants. On several occasions, the methods instructor introduced new issues that he noticed with the participants that were not readily apparent to the researcher.

The third perspective that the researcher used was that of videotape and peer comment cards. As the graduate teaching assistant, the researcher had access to videotapes of each of the lessons taught by the participants in methods class, and had asked each participant to submit their peer feedback comment cards after each lesson taught in class (Units 1,2, and 4). The researcher used these videotapes and peer comment cards to triangulate other data sources, or to introduce new ideas the researcher had not identified by field observations.

Clinical Field Experience: During each of the participant's clinical field experiences, the researcher participated as their university supervisor. Within this role, the researcher made three visits to the school in which the clinical field experience was taking place. In addition, she had conversations with the participant's cooperating teacher, in which the researcher asked questions about the participant's progress, strengths, and weaknesses. The responses given by the cooperating teachers were usually confirmatory, and superficial in nature.

By including the perspective of the methods instructor, cooperating teachers, using audio, video, and peer feedback comment cards, and involving herself within the class culture as a graduate teaching assistant and university supervisor, the researcher was able to gain an in-depth perspective of each participant, creating a relationship with each participant of communication and trust.

Student Teaching Practicum: During each participant's student teaching practicum, the researcher participated strictly as an observer. It was necessary for her to

rely more strongly on the other perspectives sought in the professionals assigned to each participant. During each site visit, the researcher had conversations with each of the cooperating teachers and university supervisor assigned to the participant (often the participant had more than one cooperating teacher). These conversations provided confirmatory information that allowed the researcher to confirm or discount patterns of the themes that had arisen from the interview and participant work sample data that had been gathered during the student teaching semester. In addition, the researcher incorporated videos of the participant's taught lessons and student surveys (provided by some cooperating teachers) about several of the participants. Again, this provided confirmatory information that allowed the researcher to confirm or discount her field observations.

By including the various perspectives described above, the researcher was able to see many sides of each of the participants, as they interacted with three major environments. The commonplaces of educating in the methods classroom, the clinical field experience, and the student teaching practicum is varied. In each setting, the teacher, the students, the curriculum, and the social milieu is different. During this study, the researcher not only considered each of these commonplaces, but observed each participant in three different settings. As a result, the researcher's understanding of each participant increased, and an in-depth description of each participant was provided for the reader.

Table 3.2: List of methods of data acquisition for each participant.

Participant Work Samples		Interviews	Observations
Eva			Field Observations
			Clinical field experience
			Video
			Audio
	Reflective summaries		Cooperating Teacher(s)
	Self evaluations		University Supervisors
	Structured journal responses	Methods semester	Methods Instructor
	Free writing journal entries	Student teaching practicum	Peer comment cards
			Student surveys
Fred			Field Observations
			Clinical field experience
			Video
			Audio
	Reflective summaries		Cooperating Teacher(s)
	Self evaluations		University Supervisors
	Structured journal responses	Methods semester	Methods Instructor
	Free writing journal entries	Student teaching practicum	Peer comment cards
Michael			Field Observations
			Clinical field experience
			Video
			Audio
	Reflective summaries		Cooperating Teacher(s)
	Self evaluations		University Supervisors
	Structured journal responses	Methods semester	Methods Instructor
	Free writing journal entries	Student teaching practicum	Peer comment cards
			Student surveys
Sarah			Field Observations
			Clinical field experience
			Video
			Audio
	Reflective summaries		Cooperating Teacher(s)
	Self evaluations		University Supervisors
	Structured journal responses	Methods semester	Methods Instructor
	Free writing journal entries	Student teaching practicum	Peer comment cards
Stephanie			Field Observations
			Clinical field experience
			Video
			Audio
	Reflective summaries		Cooperating Teacher(s)
	Self evaluations		University Supervisors
	Structured journal responses	Methods semester	Methods Instructor
	Free writing journal entries	Student teaching practicum	Peer comment cards

Triangulating Data Sources

After reviewing the participant work samples and interview transcripts for reflective passages, and extracting them from the data source, each passage was coded for factors of teacher capacity and reflection type. An example of the data collected for each

passage can be seen in Appendix J. As commonalities arose between the two data sources (participant work samples and interviews), the researcher addressed these commonalities by comparing them with the field notes, videos, and observations of the methods instructor, cooperating teachers, and university supervisors, and student surveys to provide triangulation of data sources.

Data Analysis

In this study, the researcher employed two methods of qualitative data analysis. In creating a rich, personalized, and detailed case for each of the participants in this study, the author used naturalistic generalizations (Stake, 1995). In addition, the passages that were extracted from interview transcripts and participant work samples were coded for reflection type and factor of teacher capacity. The results were quantitatively displayed and discussed within each case study. By transforming the data in this way, the researcher was able to judge the reliability within the research design of this study (Creswell, 2003).

Naturalistic generalizations focus on creating an experience for the reader in which “A narrative account, a story, a chronological presentation, personalistic description, emphasis on time and place provide rich ingredients” (Stake, 1995, p. 87). The researcher fulfills these requirements by including details about participants’ motivation to become an educator, presenting each case in a chronological way, and emphasizing the change in time, beginning in the methods semester and through the student teaching semester. Specifically within the methods semester, the researcher’s

account of each case is chronologically presented in the form of assignments that were completed in class in consecutive order.

Stake also suggests that researchers “provide adequate raw data to interpretation so that the readers can consider their own alternative interpretations” (1995, p. 87). This is done by the compilation of an appendix for each participant, in which the researcher provides raw data in the form of reflective passages that were extracted from both interview transcripts and participant work samples.

The data that was collected in this study required both qualitative and quantitative analytical methods. By addressing both perspectives, greater detail and depth is provided for each case, contributing to the reliability of the research.

Documenting Qualitative Reliability

Within this study, the researcher employed several methods recommended for documenting the reliability of case study research. The two methods of data analysis used in this study were qualitative (case study method) and quantifying the passages that were selected from the interview transcript and participant work sample data sources and coded. “This quantification of qualitative data enables a researcher to compare quantitative results with the qualitative data” (Creswell, 2003, p. 221). By comparing these two types of results, the researcher insures reliability, depth, and descriptive detail of the study. In order to transform the qualitative data into a quantitative result, the researcher developed two instruments with which to analyze the interview transcript and participant work sample data. These instruments for data analysis were developed

specifically for this study, and inter-rater reliability was used to ensure the trustworthiness of the factor of teacher capacity instrument and the reflection type instrument. Second, the author used convergence and divergence in coding and classifying each of the groups that were created from themes in the data. This check for internal homogeneity and external heterogeneity ensured the reliability of this study's design.

The following paragraphs describe how passages were selected from the data sources, and illustrate the process used by the researcher to meet each of the previously mentioned criteria.

The process of coding the selected passages was: First, the researcher read through all of the interview transcripts and participant work samples, line by line. She began by making comments in the margins, highlighting meaningful passages, and formed preliminary categories about the themes that arose from the data. Next, a sample of these themes was compared to the framework that had been developed for factors of teacher capacity (Table 3.4), and framework for reflection type (Table 3.3). Finding these themes to be aligned with the frameworks, the researcher developed official codes for both frameworks. Once the passages were placed in these categories, the totals of each group were displayed in several tables for reference and comparison between semesters. For each case study, in each semester, three tables were created; one that illustrated the type of reflection used by the participant, one that illustrated the commonplace interaction group reflected upon by the participant, and one that illustrated the factors of teacher capacity that were reflected upon critically by each participant.

Passages from interview transcripts and participant work samples were coded with three specific instruments. The first instrument used for coding reflection type was adapted from Valli (1997). The second instrument used for coding factors of teacher capacity was developed from a review of the literature on teacher knowledge, teacher beliefs, teacher thinking, and teacher education. The third instrument, an adapted model of teacher interaction was adapted from Schwab (1973). The use and development of these three instruments are described in the next section.

Data Collection Methods

Assessing Reflection Type

The type of reflection used by each participant during both the methods semester and the student teaching semester of this study was coded by using an adaptation of Valli's (1997) idea of "Orientations of Reflection". In her article "Listening to other voices: A description of teacher reflection in the United States," Valli defines five orientations of reflection, but does not assign priority to any single orientation. The researcher determined that for the purposes of this study, this model would be more appropriate to the population of secondary science pre-service teachers if it were arranged in a hierarchical fashion, and if critical reflection was defined in a more specific way. The hierarchy is illustrated in Table 3.3. The most basic form of reflection is located on the bottom of the table, and each orientation of reflection become increasingly more complex as one moves upward toward the top row of the table. The researcher's justification for

this is based on observations of and discussions with methods students, as well as pilot study data (Krim, 2007).

Valli's (1997) definition of the content of critical reflection is: The social, moral and political dimensions of schooling. She defines the quality of the reflection done at this level as: Judging the goals and purposes of schooling in light of ethical criteria such as social justice and equality of opportunity. As illustrated in Table 3.3, the researcher's definition of critical reflection, for the purposes of this study, has a more inclusive definition.

The researcher's definition of critical reflection is: The viewing of the social and ethical implications of one's practice, the understanding that one is part of the social environment in which they are teaching, and the use of evidence provided by sources outside one's own view. Table 3.3 illustrates the framework that the researcher used to code the selected passages for reflection type. After the researcher adapted this model for this study, the five orientations are placed in a hierarchical fashion, and the definition of critical reflection was revised.

Assessing Teacher Capacity

The list of factors of teacher capacity that were discussed in chapter two (table 2.3) included: pedagogy, content / subject area, curriculum / standards, pedagogical content knowledge, interpersonal, intrapersonal / self, knowledge of students / diverse learners, growth / adaptive expertise, constructivism / inquiry, and social responsibility / context. Several changes were made to this list to create the framework with which to

code the selected passages from the interview transcripts and participant work sample data sources.

The changes include creating three additional categories to classify the selected passages: planning, real world application, and classroom management. Changes leading to the creation of three new categories are described here.

The researcher created the planning category because planning, preparation, and organization are challenging areas for all pre-service teachers, including the participants in this study. This category was placed in the teacher-teacher commonplace interaction group, because the researcher felt this was a skill that dealt with the researcher's own professional responsibility. In addition, planning, preparation, and organization are necessary skills that impact all of the commonplaces.

The researcher created the real world application because making the content applicable to the real world, and therefore increasing student interest in the subject, and self-initiation is of primary importance in all meaningful learning experiences (Schunk, 2008). The category of real world application was placed in the student-curriculum commonplace interaction group, because it involves a teacher's effort to engage the student in the curriculum.

The classroom management application was extracted from the pedagogy factor of teacher capacity. Often, pre-service teachers are inexperienced with classroom management, and for a period of time, this becomes their sole pedagogical focus.

Table 3.3: Instrument used for coding selected passages for reflection type.

Code	Reflection Type	Dominant voice	Knowledge content for reflection	Quality of reflection	Source	Purpose
C	Critical Reflection	Teacher and others	Social Justice, Learner Diversity, any shift in their point of view.	The ability to consider the social, moral, and political dimensions of schooling, social and political issues	Using outside evidence (peer feedback, video, student work) to modify teaching practice.	To apply ethical criteria to the goals and processes of schooling. Judging the goals and purposes of schooling in light of ethical criteria such as social justice and equality of opportunity;
RIOA	Reflection-in and on-action	Teacher	Anything - A whole range of teaching concerns, including students, the curriculum, and instructional strategies, the rules and organization of the classroom	Judged by their ability to make and justify good decisions based on one's own unique situation.	The teacher's beliefs, classroom context, and students.	To reflect upon one's own personal performance as an educator during (spontaneous, intuitive decisions made during the act of teaching), and after a lesson, or learning experience. Judging this based on their own unique situation, or experience.
D	Deliberative reflection	Varies	Anything - A whole range of teaching concerns, including students, the curriculum, and instructional strategies, the rules and organization of the classroom.	Judged by the teacher's ability to weigh these competing claims and to give a good reason for the decisions they make.	Research, experience, the advice of other teachers, personal beliefs and values.	To develop one's teaching practice based on theories. These theories can be built from their own experience.
P	Personalistic reflection	Teacher and others	Inter-personal skills, communication.	What kind of person they want to be, and how being a teacher helps them accomplish their life goals. Concern about their students as a whole. Consciously linking their personal and professional lives.	Listening to and trusting one's own inner voice and the voices of others.	Personal growth, relationships with students, relational and personal fulfillment issues,
T	Technical reflection	Outside expert researcher	Pedagogy	Judged by the ability to match their performance to the outside expert.	Cooperating teacher's discussion or behavior, research.	Knowledge transmission

Table 3.4: Instrument used to code selected passages for factor of teacher capacity and commonplace interaction group (CIG).

Teacher Capacity			
CIG	Factor	Description	Code
Teacher-Self TS	Intrapersonal Skills	Knowledge of self, having confidence to reflect at higher levels, understanding of oneself and the capacity for introspection and reflection. One's use of material evidence (peer feedback, video, or student work) to inform their practice.	InS
	Planning	The organization and preparation necessary for teaching. Also includes lesson planning.	PI
Teacher-Social Milieu TSM	Social Responsibility	Teaching in a "culturally responsive" way. Making sure those who have been shown to fall behind in standardized tests get the attention and learning that is necessary for them to succeed. In this study includes alternative schools and issues with special needs students	SR
	Adaptive Expertise / Context	The ability to acknowledge and make decisions within the rapidly changing environment in which one works, and to be resilient, flexible, and able to maneuver around and within this environment. Also includes acceptance of ambiguity and time management. Growth as a professional	AEC
Teacher-Curriculum TC	Content / Subject Area	The subject matter that one is teaching. For the uses of this study, the subject matter consists of chemistry, biology, earth sciences, and physical science.	CSA
	Curriculum / Standards	The scope and sequence of the content material one is expected to teach within the year, and the national, state, and local standards which set objectives for this material being covered.	CS
Student-Curriculum SC	Pedagogical Content Knowledge	Knowledge about how learner's think, the influence of instruction on learning, as well as the best way to teach content to a learner.	PCK
	Constructivism / Inquiry	Constructivism (constructing meaning with learners) and/or inquiry learning and teaching. (students are presented with experiences that encourage them to ask questions and conduct their own research).	CI
	Real World Application	Applying a learning principle to a real-life situation, increases student interest and investment in the topic.	RWA
Teacher-Student TS	Pedagogy	General teaching skills that are applicable to any subject. The art or science of teaching.	Pd
	Interpersonal Skills	The ability to communicate with others; or "people skills", and thinking in an ever expanding scope of professional community	InS
	Knowledge of Students / Learner Diversity	Knowledge and appreciation of students' cognitive differences (diversity in personality and learning styles), and empirical differences (ethnicity, nationality, religion, sexual preference, physical features, individual life choices, cultural factors, or body image. Includes making the effort to get to know students outside the classroom.	KSLD
	Classroom Management	Anything dealing with how to manage classroom behavior.	CM

The researcher determined that by creating a category for classroom management, other pedagogical skills would be noted and discussed by both the researcher and the

participants. The researcher placed this new classroom management category in the teacher-student commonplace interaction group, because classroom management focuses mainly on the teacher's interaction with the student.

By creating these three new categories, the researcher was able to modify the existing framework to be more appropriate to the population of participants in this study. The framework that was used to code selected passages for teacher capacity factor and commonplace interaction group is illustrated in Table 3.4.

Reliability Analysis: Convergence and Divergence in Coding and Classification

Once selected passages were identified and extracted from the interview transcript and participant work sample data sources, they were combined into a comprehensive list of passages (n=687). The researcher managed this exhaustive list by maintaining specific information about each of the passages, including: participant name, data source, and semester the passage was taken from.

The researcher then coded each passage using the instrument for reflection type and the instrument for factor of teacher capacity and commonplace interaction group. Several passages (n = 19) did not fit the framework that had been developed, and were removed from the list of passages. Each coding category was then separated from the comprehensive list and reviewed to ensure that each passage met that category's criteria. Passages that did not meet the category's criteria were then placed in another category that was more appropriate, or discarded from the list if the passage did not meet any criteria (n=15).

As a final step to ensure the codes and their definitions were accurate, an outside participant was selected by the researcher to code a representative sample of the passages by reflection type (n=29) and by factor of teacher capacity (n=27). The results of this second independent coding were compared with the researcher's coding, and statistically analyzed using Cohen's Kappa. The resulting Kappa value when coding for reflection type was .773, and when coding for teacher capacity factor, the value was .723, both indicating substantial agreement between raters.

Validity

Each of the methods that contributed to the validity of the results produced by this study was discussed in separate sections. In summary, the methods that guided the design of this study that contributed to the validity of the researcher include: Triangulation of data sources, member-checking, clarifying the researcher's bias, collecting evidence as a participant-observer, and a prolonged time that the researcher spent in the field (Creswell, 2003).

Limitations

The participants in this study were chosen based on a set of criteria that would exemplify the average undergraduate student found at this university. Because of the purposive sampling method, the results of this study can be generalized to some but not all students in the same type of teacher education program. The results are best interpreted as a description of the idiosyncratic experiences of the subjects of the study.

There were two limiting factors with the participants in this study that could possibly have influenced the results of this study. With all participants, an accurate assessment of the pre-service teachers' reflection on two factors of teacher capacity could be severely limited, in the researcher's point of view. The first is the teacher capacity factor of social responsibility, which includes teaching in a 'culturally responsive' way, and making sure those who have been shown to fall behind in standardized tests get the attention and learning that is necessary for them to succeed. The second, learner diversity, includes both cognitive differences and empirical differences in learners. The specific focus of this limitation is: empirical differences of ethnicity, nationality, religion, and cultural factors within this factor of teacher capacity. The noteworthy demographic information of the location in which this study took place is: a town population of 27,500, and 90.6 percent Caucasian inhabitants. If this study took place in a place with a more ethnically varied or larger area, there could be different results in the factors described above.

Summary

At this point, the researcher has presented three chapters: chapter one included a summary of the study, chapter two presented a theoretical framework for the study, and chapter three provided a detailed and descriptive explanation of how the research would be conducted. The most important points from these chapters are re-iterated in the following paragraphs.

This study focused on the role of critical reflection in teacher capacity, and how the knowledge, skills, and dispositions of secondary science pre-service teacher

candidates developed the skills of critical reflection during their pre-service program. The concept of critical reflection and teacher capacity have been addressed in the educational research literature but not combined as in this study.

Our current understanding of what a teacher should know, be able to do, and believe is described by the term teacher capacity. For the purposes of this study, teacher capacity is meant to describe the compilation of ten key factors: pedagogy, Content / Subject Area, curriculum / standards, pedagogical content knowledge, interpersonal, intrapersonal / self, knowledge of students / diverse learners, growth / adaptive expertise, constructivism / inquiry, and social responsibility / context.

The commonplaces of educating represent the entities that teachers interact with in their professional life. The new adaptation of commonplace interaction groups that was developed for this study; teacher-self, teacher-student, teacher-curriculum, teacher-social milieu, and student-curriculum can exist as a framework with which to view the factors of teacher capacity in this study. In addition, the commonplaces of education illustrate that teachers, students, and curriculum are all part of the social milieu in which education takes place. This perspective contributes to the definition of critical reflection that is used for the purposes of this study.

Developing a critically reflective practice is important for the success of secondary science pre-service teachers. For the purposes of this study, critically reflective practice is defined as: the viewing of the social and ethical implications of one's practice, the understanding that one is part of the social environment in which they are teaching,

and the use of evidence provided by sources outside oneself, such as peer feedback, video, and student work to inform one's practice.

The research methodology, discussed in this chapter, was case study and the data acquisition methods employed included interviews, direct and video observations, and participant work samples of five undergraduate science education pre-service students over two semesters. In addition, in this chapter, the researcher illustrated how this study is founded in constructivist and sociological theory. An explanation of the development of each of the frameworks chosen to analyze the data was provided, and finally, a discussion of the validity and limitation of this study were discussed. In the next chapter, Chapter 4, the researcher presents the results of this study, organizing them into five separate sections; one for each participant.

CHAPTER 4

RESULTS

Introduction

How did critical reflection inform teacher capacity within the secondary science pre-service teachers in this study? What knowledge, skills, and dispositions of secondary science pre-service teachers contributed to the development of a critically reflective practice? This chapter reports the results of the study and attempts to answer these research questions.

In this chapter, there are six sections. The first five sections report the results of five individual case studies. The last section synthesizes the results and attempts to answer each of the research questions, identifying patterns of reflection that are meaningful to the development of teacher capacity and critically reflective practice for all the participants.

Each of the five case studies is arranged in a sequence that helps maximize the reader's personal engagement with the participants and with the data, and the researcher suggests that the reader reviews the raw data provided in Appendix J and K to familiarize themselves with the raw data for each participant, and to draw their own conclusions prior to reading the researcher's interpretation (Stake, 1995). For each case study, the researcher introduces the participant by presenting a brief description of his/her background. Next, the researcher quantifies the coding of passages gathered from interview transcripts and participant work samples from both the methods and the student

teaching semesters through the frameworks of reflection orientation, teacher capacity and commonplace interaction groups that were previously established in this study.

For each case study in this section, the results from this threefold coding is displayed using a total of seven tables. The first three (Table a, illustrating the complexity of reflection orientation used by each participant, Table b, which displays an analysis of factors of teacher capacity reflected upon by the participant in the highest level of reflection, and Table c, which presents the participant's reflections analyzed by commonplace interaction group), focus on the participant's development during the methods semester. The second three, Tables d, e, and f, focus on the same information for each participant during the student teaching semester. Finally the seventh table in this section comparatively displays the major areas of the professional development of each participant over both semesters.

Next, the passages collected during the course of this study from interview transcripts and work samples were examined within the framework of factors of teacher capacity for complexity and depth of meaning. To simplify this analysis the researcher created a table, assigning symbols to factors of teacher capacity that increased (+), decreased (-), or did not change (**Ø**) in complexity and depth of thought from the methods semester to the student teaching semester. Some factors of teacher capacity are not mentioned in this section, because not all factors of teacher capacity were reflected upon during both semesters and because of this, a comparison could not be made. Characteristics that indicated growth in one's capacity as an educator were identified in several of the case studies. However, the researcher chose to only exemplify the cases in

which the results of these characteristics were evident. These characteristics were then verified through triangulation with discussions and conversations with key individuals involved with each participant's pre-service experience.

Finally, the same passages were again examined for complexity and depth of meaning, this time interpreted through the framework of the definition of critical reflection that that researcher developed specifically for this study. As previously stated in this study, the researcher's definition of critical reflection involves three aspects: Pre-service teachers view the social and ethical implications of their practice, pre-service teachers acknowledge that they are part of the social milieu in which they teach, and pre-service teachers use outside evidence to inform their practice. Similar to the previous section, factors related to critically reflective practice are identified within the data collected and discussed in this section.

In each of these three sections, references are made to passages either by citing them, or by referring to a code - for example "E05". This coding is a way to let the reader know that the passage that is being discussed was created by Eva (E), and is the fifth (05) passage within the appendix. This brief code is a way for the reader to identify the passage quickly in the appendix. Within Appendix J is a list of all passages from all participants, and in addition to this brief code, each passage was coded in several ways, to identify the participant, semester, date, reflection orientation and factor of teacher capacity (Table 4.1).

Table 4.1: Illustration of codes used to identify data in each passage (Appendix L)

Data Sources	I	Interview
	RS	Reflective Summary
	PWS	Participant Work Sample
	SJR	Structured Journal Response
	SE	Self-Evaluation
	FWJE	Free Writing Journal Entry
Semester	MS	Methods Semester
	STS	Student Teaching Semester
Factor of Teacher Capacity	IaS	Intrapersonal Skills
	PI	Planning
	SR	Social Responsibility
	AEC	Adaptive Expertise / Context
	CSA	Content / Subject Area
	CS	Curriculum / Standards
	PCK	Pedagogical Content Knowledge
	CI	Constructivism / Inquiry
	Pd	Pedagogy
	InS	Interpersonal Skills
	KSLD	Knowledge of Students / Learner Diversity
	CM	Classroom Management
Orientation of Reflection	T	Technical Reflection
	P	Personalistic Reflection
	D	Deliberative Reflection
	RIOA	Reflection-in and on-action
	C	Critical Reflection
Commonplace Interaction Group	TT	Teacher-Self Interaction
	TSM	Teacher-Social Milieu Interaction
	TC	Teacher-Curriculum Interaction
	SC	Student-Curriculum Interaction
	TS	Teacher-Student Interaction

By examining the development of each participant from these three perspectives, it was possible for the researcher to use quantitative and qualitative measures to identify broad patterns of pre-service teacher development, which includes building a critically reflective practice, and increasing one's capacity as an educator.

Case Study 1: Eva

According to the subject's self-report, growing up, Eva grew up living on a farm in a small town. Her family was hardworking and involved in many community activities. Both her mother and her aunt were schoolteachers, and as she was growing up, Eva would always dream about becoming a teacher just like them. She saw all the joys as well as all of the frustrations that came with the job of being a career educator.

Once enrolled in college, and faced with an abundance of career choices, Eva debated about choosing a career. "The only detail I knew was it had to involve a subject that I find very captivating—Science. Teaching was definitely on my list but it was only one of many choices." She was persuaded by the prestige of engineering and at first decided on Chemical Engineering as her major. However, after her first year, she realized that she was a very social person that needed a job with more human interaction to be fully satisfied. "So, for the second time teaching science made my list of many (September 2007)." After giving her list some thought, she again remembered all of the frustrations that would come with a career of teaching. There was low pay, high stress, and for the second time, Eva again turned away from teaching and chose Nutrition as her major.

After a short time in this major, Eva determined that this major didn't suit her needs. She considered majors in Geology, Biology, or Chemistry, but could never decide on just one. They all sounded appealing to her, but she was worried that if she picked just one she might get bored with it over time. Finally, after considerable thought, Eva came to the conclusion that teaching science would be a good professional option. She

explained, “I would get to study all areas of science, hopefully teach all of them as well, every day would be a new endeavor, and I would get to work with plenty of students.”

Eva applied to the teacher education program, and was accepted.

In an anecdotal science methods class assignment (September 2007), Eva wrote:

I do not know why it took me so long to realize teaching is really what I wanted to do. All through my 22 years my friends, especially my mother, have been hinting towards me becoming a teacher and how natural it would be. Nevertheless, I would just take it as a compliment and think nothing more of it. I suppose I had to experience new fields before I could settle on what I knew in the back of my mind what I wanted to do all along.

During this period, Eva explained in an interview setting (September 2007) that she envisioned herself as a teacher who would be “very open”, and have a relaxed and friendly disposition. She had observed several classrooms (including her mother’s), and began to actively develop her teaching style by considering pedagogical methods that seemed to work, those that didn’t work, and some she might consider adopting in her own teaching. For example, she observed teachers who she considered to have poor management skills, and contemplated how she would conduct her class in a different way.

One teacher in particular, Mrs. Merkin, had an identifiable impact on Eva’s transition from student to teacher. Mrs. Merkin was Eva’s teacher in fifth grade, and at an early point in Eva’s undergraduate program, she observed Mrs. Merkin’s classroom. Eva explained in an interview (September 2007), that during one period of the observation, Mrs. Merkin sternly reprimanded several students, who responded appropriately. She gave them a look that Eva remembered from her personal experience. Eva was surprised

when, after reprimanding the students, Mrs. Merkin looked up at Eva and winked. During the first interview (September 2007), Eva described her experience:

When we had her in fifth grade, we always talked about “mean old Mrs. Merkin”. We thought she was a really tough teacher. But when I saw her with the special needs kids in a different environment, she seemed a lot nicer and friendlier. But then again I was older and we could connect a lot easier. I really enjoyed being with her in that class. Maybe we were just hard on her as fifth graders. We were probably a wild class too.

This experience enabled Eva to consider an inside view of a teacher’s sense of humor, and contributed to her own developing knowledge, skills, and dispositions about teaching.

Eva also reported that during her undergraduate years, she participated in an exchange program to the University of Hawaii, Manoa in Honolulu, where she enrolled in classes and field trips to the lava fields and studied the local geology. Eva took videos, pictures, and vividly remembered her experiences, hoping later to use them in her teaching. While attending classes back home, she worked part-time in an agricultural genetics lab on campus. As she approached her senior year, these prior experiences contributed exponentially towards the excitement and anticipation of the teacher preparation program (interview, September 2007).

Quantitative Analysis of Passages – Methods Semester

All of the selected passages from interview transcripts and work samples during Eva’s science methods semester were coded for reflection type, factor of teacher capacity, and commonplace interaction group.

Table 4.1a: Complexity of the reflection types used by Eva during the methods semester. The types of reflection are categorized into low, mid, and high.

	Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	4	E10 E15 E27 E35	.09			
Reflection-in and on- action	9	E04 E06 E07 E19 E21 E38 E41 E42 E46	.20	High	.29	
Deliberative	19	E05 E08 E09 E11 E12 E14 E16 E17 E18 E20 E28 E33 E34 E36 E39 E40 E43 E44 E45	.41	Mid	.41	
Personalistic	8	E02 E03 E13 E22 E23 E24 E25 E37	.17			
Technical	6	E01 E26 E29 E30 E31 E32	.13	Low	.30	
TOTAL	46					

Table 4.1a illustrates the types of reflection Eva utilized during methods class.

The majority of her reflections were of the deliberative orientation (Table 3.3), meaning that she was building theories based on her own experience. In a reflective summary, Eva talks about her team-teaching experience, in which the methods class behaved in an unexpected way (Field Notes October 2007):

We also found that things are not going to go as planned and that the teacher should be prepared to go where they had not planned on going with the topic and be able to transition into it as if nothing has changed (E20).

As a result of this experience where things did not go as planned, Eva was able to build a theory about preparation and teaching in a community of her peers.

Table 4.1b: Of the high level of reflection (critical and reflection-in and on-action), Eva's reflections in the methods semester revealed a focus on the following factors of teacher capacity.

	Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	1	E06		.08
Planning	3	E10 E21 E46		.23
Social Responsibility	0	---		---
Adaptive Expertise / Context	0	---		---
Content / Subject Area	1	E41		.08
Curriculum / Standards	0	---		---
Pedagogical Content Knowledge	1	E38		.08
Constructivism / Inquiry	1	E27		.08
Real-World Application	0	---		---
Pedagogy	2	E15 E35		.15
Interpersonal Skills	0	---		---
Knowledge of Students / Learner Diversity	1	E07		.08
Classroom Management	3	E4 E19 E42		.23
TOTAL	13			

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.1b. There are only 13 passages in this small sample of Eva's higher-level reflections, but the two factors of teacher capacity that Eva reflected on most frequently were that of planning and classroom management. In a reflective summary after the first teaching lesson, Eva comments, "I knew that my

closure was weak, and the video showed me that I think I was rushing a bit and just wanted to be done” (E10). This example of critical reflection shows Eva’s use of outside evidence to support her private reflections after the lesson. The researcher chose this passage to represent the planning factor of teacher capacity because within the context of Eva’s reflective summary, this information informed her future planning practice. After the group lesson, Eva reflects on reasons why the class became disruptive (Field Notes, October 2007). “While planning the lab, we probably should have better planned out specific questions and who was going to ask the specific questions at each table” (E19). Eva’s reflection on decisions made when planning the lab, and how these decisions affected the teaching of the lesson allowed her to inform her practice, as she continued to build theories based on her experience as a pre-service educator.

Table 4.1c illustrates Eva’s reflection on commonplace interactions during the methods semester. The majority of the reflections reviewed from interview transcripts and participant work samples were focused on the teacher-self commonplace interaction group. In an interview, Eva summarizes her experience during the methods semester:

I think, as a teacher you have to change and grow and that’s what this Methods class was all about, was to help us become a better teacher and learn what we need to do and what kind of teacher we are. So I think even in the next twenty years of teaching I’ll probably still change how this being a significant moment is part of being a teacher, I think (E13).

Eva understood what she was learning and how it fit into the larger scheme of her preparation as a teacher was unique and the researcher observed that this dispositional perspective assisted Eva in staying focused and behaving in a professional manner throughout the duration of this study.

Table 4.1c: Eva's reflections during the methods semester, analyzed by commonplace interaction group.

Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections by Commonplace Interaction Group
Teacher-Self	16	E05 E06 E10 E11 E12 E13 E20 E21 E29 E30 E31 E32 E33 E43 E45 E46	.33
Teacher-Social Milieu	9	E01 E02 E03 E16 E22 E23 E24 E25 E26	.19
Teacher-Curriculum	1	E41	.02
Student-Curriculum	11	E08 E09 E14 E17 E18 E27 E37 E38 E39 E40 E44	.23
Teacher-Student	9	E04 E07 E15 E19 E28 E34 E35 E36 E42	.23
TOTAL	46		

Included in the teacher-self commonplace interaction group are the factor of teacher capacity of intrapersonal skills and planning. This is the second appearance of this factor of teacher capacity of planning (first seen in the higher level reflection analysis and again as a factor of the most frequently reflected-upon commonplace interaction group), which demonstrates that this was Eva's major focus during the methods semester.

There were several factors of teacher capacity that Eva neglected to reflect upon during the methods semester. These included: social responsibility (teacher-social environment commonplace interaction group), curriculum / standards (teacher-curriculum commonplace interaction), and real world application (student-curriculum commonplace interaction). Because these factors of teacher capacity were distributed across three

commonplace interaction groups that consisted of more than the neglected factor, the researcher concluded that there was no pattern to the factors of teacher capacity that Eva did not reflect upon.

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Eva's development of a critically reflective practice during the methods semester, several distinctive characteristics were seen: Eva reflected most frequently in the deliberative orientation of reflection, and her higher level reflections focused on the factors of teacher capacity such as planning and classroom management. She reflected most often on the teacher-self commonplace interaction group, and Eva's reflections did not focus at all on the factors of social responsibility, curriculum / standards, and real world applications.

After reviewing these results, the researcher felt that Eva's focus on planning was indicative of her position as a methods student, as she was thinking about the following semester, and trying to prepare herself as best as she could. With the understanding that Eva's mother and aunt were educators, and that Eva grew up in this environment, it is quite possible that she had an accurate idea of what would be needed to be successful in student teaching, and to prepare herself for a career in education.

Quantitative Analysis of Passages – Student Teaching Semester

By examining the orientations of reflection Eva used, the factors of teacher capacity and commonplace interaction groups she chose to reflect upon, the researcher continued to analyze Eva's patterns of reflection during the student teaching semester,

and was able to identify defining characteristics of her development as a pre-service educator.

Table 4.1d illustrates the orientations of reflection Eva used during student teaching. The majority of her reflections during this semester, evidenced by passages selected from interview transcripts and participant work samples were of the deliberative and personalistic orientations (Table 3.3). Eva's focus on these two orientations indicates that she continued to develop her teaching practice based on experience, as she did during the methods semester. In an interview, Eva reflects deliberatively on her teaching style with a specific class:

[I think the best approach to use with these students is] a little bit of both, [teacher-centered and student-centered] because sometimes when they read, they like to read really fast and be really quiet. Then nobody listens, but they don't listen to me either so I try to get a little bit of both (E58).

By adjusting her teaching practice to the needs of the students, Eva learned that it was necessary to consider many variables in order to plan and execute a lesson effectively.

Through personalistic reflections, Eva also focused on her own personal growth and her relationships with students. In a free writing journal, she reflects on her relationships with her students:

I think I am very positive with the kids. I congratulate good ideas, questions, and tricks on how to remember certain terms. I like to make simple comments on their homework and tests such as good, nice job, or wonderful, especially for essays that they answered really well. I also complement them if they look good or have cute jewelry (E76).

This type of reflection shows that Eva is developing her relationship with students, and at the same time, developing an image of herself as an educator, and how she relates to children in that capacity.

Table 4.1d: Complexity of the reflection types used by Eva during the student teaching semester. The types of reflection are categorized into low, mid, and high.

	Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	4	E49 E50 E51 E55	.10			
Reflection-in and on- action	7	E54 E67 E68 E69 E70 E82 E83	.17	High	.27	
Deliberative	16	E47 E52 E53 E56 E57 E58 E59 E60 E61 E62 E63 E71 E72 E73 E74 E86	.38	Mid	.38	
Personalistic	13	E48 E64 E65 E66 E75 E76 E77 E78 E79 E80 E81 E87 E88	.31			
Technical	2	E84 E85	.05	Low	.36	
TOTAL	42					

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.1e. In the higher levels of reflection, the factor of teacher capacity most reflected upon by Eva in interviews and participant work samples is that of interpersonal skills. In an interview where the researcher and Eva viewed a video of her teaching, Eva commented, “Oh, here, I think I interrupted Kate right in the middle of that and I should have waited until the end. So when I did that, I was like, oh I completely disrupted this and now nobody's paying attention” (E70). Eva’s reflection upon her interpersonal reaction with this one student during a lesson and how it affected

the rest of the class behavior illustrates her thoughtfulness about her ability to make and justify good (or bad) decisions based on a unique situation.

Table 4.1e: Of the high level of reflection (critical and reflection-in and on-action), Eva's reflections in the student teaching semester revealed a focus on the following factors of teacher capacity.

Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	2	E61 E62	.18
Planning	0	---	---
Social Responsibility	0	---	---
Adaptive Expertise / Context	0	---	---
Content / Subject Area	1	E55	.09
Curriculum / Standards	0	---	---
Pedagogical Content Knowledge	0	---	---
Constructivism / Inquiry	0	---	---
Real World Application	1	E49	.09
Pedagogy	2	E67 E82	.18
Interpersonal Skills	3	E68 E69 E70	.27
Knowledge of Students / Learner Diversity	1	E54	.09
Classroom Management	1	E83	.09
TOTAL	11		

Table 4.1f illustrates Eva's reflection on commonplace interactions during the student teaching semester. The majority of her reflections focus on the teacher-student commonplace interaction group. In a free writing journal, Eva discusses her relationship with her students:

I feel like I am a very personable and friendly teacher. I have a very good relationship with most of my students and they seem to respect me . . . I've heard from one of the other student teachers that students say that they really like my class, so that really helps my confidence as well. Another one of my strengths I think is volcanoes. Since I've been to Hawaii, hiked on the volcano and seen lava, I get really excited talking about it and I think that will transfer to the students and help them to get excited about it too (E75).

Eva's focus on her interactions with her students relates to the personalistic orientation of reflection (inter-personal skills and communication) that was a focus for her reflections during this semester. The researcher concluded that her focus also demonstrated that she felt these interactions were important.

Table 4.1f: Eva's reflections during the student teaching semester, analyzed by commonplace interaction group.

Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections by Commonplace Interaction Group
Teacher-Self	10	E48 E50 E51 E63 E66 E72 E73 E74 E84 E85	.24
Teacher-Social Milieu	7	E47 E65 E78 E79 E80 E81 E88	.17
Teacher-Curriculum	2	E55 E87	.05
Student-Curriculum	4	E49 E52 E56 E86	.10
Teacher-Student	19	E53 E54 E57 E58 E59 E60 E61 E62 E64 E67 E68 E69 E70 E71 E75 E76 E77 E82 E83	.45
TOTAL	42		

There were several factors of teacher capacity that Eva neglected to reflect upon during the student teaching semester. These include: curriculum / standards (teacher-

curriculum commonplace interaction group) and constructivism / inquiry models of teaching (student-curriculum commonplace interaction group). Because these factors of teacher capacity were again distributed across two commonplace interaction groups that consisted of more than the neglected factor, the researcher was not able to identify a pattern within this semester. However, it was important to note that Eva did not reflect upon the curriculum / standards factor of teacher capacity in either semester. The researcher concluded that this could be a weak area in Eva's planning, but a review of the field notes, video and audio data, and general observations throughout this study did not reveal any deficiencies in Eva's knowledge of curriculum and standards.

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Eva's development of a critically reflective practice during the student teaching semester, several distinctive characteristics were seen: Eva continued to reflect most frequently in the deliberative orientation, but also relied heavily on reflecting in the personalistic orientation. Her higher-level reflections focused on the interpersonal skill factor of teacher capacity, which is included in the commonplace interaction group upon which Eva reflected most frequently. Eva's reflections did not focus at all on the factors of teacher capacity such as curriculum / standards or constructivism / inquiry.

After reviewing the results from the student teaching semester, the researcher felt that Eva's focus on interpersonal relationships was unique to her professional practice. The excitement and passion that Eva showed towards teaching was unmatched among all of the participants.

Table 4.1g: A comparison of the distinctive characteristics of Eva's reflective practice in the methods and student teaching semester.

	Methods Semester	Student Teaching Semester
Orientation of Reflection	Deliberative	Deliberative and Personalistic
High Reflection and Factor of Teacher Capacity	Planning Classroom Management	Interpersonal Skills
Commonplace Interaction Group Focus	Teacher-Self	Teacher-Student
Missing Factor of Teacher Capacity	Social Responsibility Curriculum / Standards Real-World Application	Curriculum / Standards Constructivism / Inquiry

By examining the data from both semesters (Table 4.1g), the researcher was able to identify several important patterns. First, Eva's orientation of reflection shifted from one semester to the next to accommodate her professional and developmental needs. Next, Eva's focus of interactions also shifted from reflections about herself (internal) to reflections about herself and her relationship with others (external). Lastly, Eva consistently did not reflect upon the curriculum / standards factor of teacher capacity during the course of this study.

Qualitative Analysis - Teacher Capacity

This section complements the quantitative results discussed in the first section by examining the complexity and depth of passages categorized within the framework of teacher capacity. Table 4.2h illustrates this examination by indicating which factors of teacher capacity contained passages that increased, decreased, or stayed the same in regards to complexity and depth.

Table 4.1h: Eva's changing ability to reflect on factors of teacher capacity

	Passages Reviewed that Increased in Complexity and Depth	Passages Reviewed that Decreased in Complexity and Depth	Passages Reviewed that had no Change in Complexity and Depth
Factor of Teacher Capacity	Intrapersonal Skills	Adaptive Expertise / Context	Social Responsibility
	Planning		Curriculum / Standards
	Content / Subject Area		Constructivism / Inquiry
	Interpersonal Skills		Real-World Application
	Knowledge of Students / Learner Diversity		
	Classroom Management		

Within the increasing factors of teacher capacity, several major themes were seen in Eva's passages. These themes arose from triangulation of the quantitative and qualitative analysis of the data, including coding by the frameworks of reflection orientation, teacher capacity, and commonplace interaction groups. The researcher viewed these themes as indicators of an increase in Eva's capacity as a teacher.

Multiple Perspectives: As Eva entered the student teaching semester, several passages in the interpersonal skill factor of teacher capacity contain questions about her beliefs and thoughts about how these impacted her teaching practice, and about how that teaching practice affected the students. In the methods semester, the perspective of these passages was limited to her own, and sometimes her cooperating teacher's viewpoint. Upon review of these results, the researcher felt that Eva's increasing ability to consider the implications of her beliefs, how that translated to her teaching behaviors and how those behaviors impacted her students is important because it indicates maturation of her professional dispositions.

Advance Planning: During the student teaching semester, Eva demonstrated that she was inquiring into her cooperating teachers' practice, and comparing that practice with her own. She also showed development in the area of planning for future lessons. During the methods semester, she had often planned unsuccessfully, as illustrated by passages E38, E39, and E40. She comments in a passage during the student teaching semester, "As long as I have a general game plan and know what is coming up in the next week, I don't get too stressed out about having to have every detail planned out" (E74). The ability to correctly identify the areas of one's weaknesses in his/her preparatory behaviors and practices is necessary for a master teacher, and knowing how much planning is necessary is a positive characteristic of developing professionalism.

Using Prior Knowledge in a New Context: In the factor of teacher capacity that focuses on content / subject area, Eva demonstrated a meta-cognitive practice (concept mapping), which was introduced to her in methods class. Eva used concept mapping to both organize her thoughts and to further understand the content area she was teaching. Eva's ability to use prior knowledge in a new situation indicates a higher level of understanding and application of science content and teaching context, and a pro-active thought process.

Relating to Student as Individuals: In the methods semester Eva reflected most frequently on effective teaching strategies. For example, in a structured response journal, she writes, "I think [a] variety of assessment is necessary and allows most students to express what they have learned" (E35). However, in the student teaching semester, as

she increased the complexity of her reflection in specific factors of teacher capacity, she began considering specific students, and their needs in her classroom:

I use concept mapping a lot. I use it for some kids who struggle. I will make one for them or make one with them, like the day before a test. Or I will make it as I'm trying to figure out how I'm going to lay out my notes, because I don't know how the sections go, like plate tectonics (E86).

Eva exhibited this trait of relating to students as individuals in multiple factors of teacher capacity, such as Interpersonal Skills, Knowledge of Students / Learner Diversity, and Classroom Management.

The researcher concluded that the themes discussed in the previous paragraphs- multiple perspectives, advance planning, using prior knowledge in a new context, and relating to students as individuals- were a part of the developmental process of a secondary science pre-service teacher, and indicated an increase in Eva's capacity as a teacher. In the following section (section three of this case study), Eva's development of a critically reflective practice is discussed.

Qualitative Analysis - Critical Reflection

In this section, the researcher attempts to provide evidence to answer the research question "Did Eva's critically reflective passages increase in complexity and/or depth? By comparing reflective passages collected during the methods semester (n=4) with reflective passages collected during the student teaching semester (n=4), the researcher concluded that Eva did increase her level of critical reflection, evidenced by Eva's growing consideration of external factors in her assessment of her teaching practice. She also constructed assignments by assessing the needs of her students (E49), used video to

observe and reflect on her teaching practice (E55), and spoke about how she would use the new knowledge she learned (through reflection) when teaching the next lesson (E50). In light of these three behaviors, the evidence indicates that Eva assessed her strengths and weaknesses, she used outside evidence (conversations with cooperating teacher and videotaping lessons) to assist her in this examination, and she planned ahead for the next lesson incorporating what she had learned into her classroom practice, all of which are representative of this study's definition of critical reflection.

Case Summary - Eva

In viewing Eva's development of factors of teacher capacity and critical reflection throughout the methods and student teaching semesters, several patterns were revealed. First, quantitative analysis of passages from interview transcripts and participant work samples indicated that Eva's reflections shifted from an internal (intrapersonal or teacher-self) focus in the methods semester to an external (interpersonal or teacher-student) focus in the student teaching semester. Second, qualitative analysis of these passages through the teacher capacity framework indicated that Eva increased her teacher capacity in the areas of intrapersonal skills, planning, content / subject area, interpersonal skills, knowledge of students / learner diversity, and classroom management. Within these areas, Eva exhibited several characteristics, all of which indicated to the researcher that Eva had increased her level of teacher capacity: considering multiple perspectives, advance planning, using prior knowledge in a new context, and relating to students as individuals. Lastly, a second qualitative analysis of these passages through the framework of critical reflection indicated that Eva demonstrated a high level of critical reflection in

which she was able to accurately assess areas of strength and weakness (with assistance from outside evidence), and used that information to improve her practice. Eva consistently did not reflect upon the curriculum / standards factor of teacher capacity.

Case Study 2: Fred

According to Fred, he dreamed as a child of becoming a doctor. Both of his parents worked in the medical field, and it seemed an obvious choice to follow in their footsteps. However, as a teenager, he had several serious hospital visits, and consequently lost his drive to work in the medical field. Instead, he enrolled in college with the intention of pursuing a degree in environmental science.

While studying this subject, he had experiences with many courses and professors, and was able to observe many different teaching styles for each aspect of environmental science. His advisor, who was also his professor, had the largest influence on his undergraduate career. As he came to know Dr. Sawyer not only as a professor but as a friend, they formed a strong mentor-mentee bond. Dr. Sawyer mentored Fred through his courses as well as his personal life. It was through this relationship that Fred came to the realization that teaching could be the career for him. He explained:

My motivation to teach comes from a desire to help others, which is a great quality I have always carried in my heart. I have been a student in the education system for many years and now I want to give back.

Fred was motivated to be a teacher so he could help guide youngsters in education as well as in life. Following an undergraduate degree in environmental science Fred enrolled in the two-year teacher certification program in which he was required to take basic education classes, including Methods of Teaching Secondary Science, and Student Teaching. His motivation to become a teacher increased with each class.

Quantitative Analysis of Passages - Methods Semester

All of the selected passages from interview transcripts and Fred's work samples during the methods semester were coded for reflection type, factor of teacher capacity, and commonplace interaction group.

Table 4.2a: Complexity of the reflection types used by Fred during the methods semester. The types of reflection are categorized into low, mid, and high.

Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	9	F001 F007 F009 F010 F011 F012 F031 F034 F036	.24		
Reflection-in and on-action	4	F006 F025 F033 F038	.12	High	.36
Deliberative	13	F002 F003 F004 F005 F008 F013 F014 F015 F016 F017 F032 F035 F037	.34	Mid	.34
Personalistic	7	F018 F019 F020 F021 F022 F023 F024	.18		
Technical	5	F026 F027 F028 F029 F030	.13	Low	.31
TOTAL	38				

Table 4.2a illustrates the types of reflection used by Fred during methods class. The majority of his reflections were of the deliberative orientation (Table 3.3), meaning that Fred, like Eva, was building theories based on his experience during methods class. During an interview late in the semester, the researcher asked Fred about what he was learning in his clinical field experience regarding alternative assessment. He replied, "I think it is important, as we learned just the other day in Methods, to cater to the learners

needs and learning abilities. Not everyone thinks the same” (F034). Fred’s response, which incorporated the theory of what he had learned in methods class with the clinical field experience, illustrates that he was developing his teaching practice based on theories that were both taught to him in the classroom and experienced in the field.

Table 4.2b: Of the high level of reflection (critical and reflection-in and on-action), Fred’s reflections in the methods semester revealed a focus on the following factors of teacher capacity.

Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	3	F001 F011 F012	.23
Planning	1	F036	.08
Social Responsibility	1	F010	.08
Adaptive Expertise / Context	1	F038	.08
Content / Subject Area	0	---	---
Curriculum / Standards	0	---	---
Pedagogical Content Knowledge	2	F006 F007	.15
Constructivism / Inquiry	0	---	---
Real-World Application	0	---	---
Pedagogy	0	---	---
Interpersonal Skills	1	F009	.08
Knowledge of Students / Learner Diversity	2	F033 F034	.15
Classroom Management	2	F025 F031	.15
TOTAL	13		

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection) that were selected from interview transcripts and participant work samples are illustrated by Table 4.2b. Although the sample is small, the factor of teacher capacity most commonly reflected on by Fred was intrapersonal skills. In a structured response journal entry, Fred illustrated his high level of reflection in this factor of teacher capacity. Fred explains that in his field experience, his cooperating teacher, Mr. S., gave a motivational talk to his students. Fred comments, “Mr. S. even touched me personally with his speech as I was encouraged to look within myself and work hard to finish up my semester” (F011). After reviewing the field observation notes about Fred, the researcher concluded that throughout the semester, Fred eagerly used any and all opportunities to improve his ability as a pre-service teacher.

Table 4.2c illustrates Fred’s reflection on commonplace interactions during the methods semester. The majority of passages extracted from interview transcripts and participant work samples were focused on the teacher-student commonplace interaction group. In a student response journal entry, Fred writes about his clinical field experience:

I have been closely observing how Mr. S. handles discipline problems in his classes. It is amazing to me how the character of each one of his classes is so very different. He must adapt and vary the level of his disciplinary actions. In some classes, he can allow a little more freedom due to the responsibility of his students. Other classes, such as his 5th period, would run rampant if given the opportunity to have any freedom (F030).

This passage, along with the researcher’s general observations of Fred during this semester illustrates that Fred was considering multiple perspectives in his professional development. He was consciously incorporating what he had learned in methods class,

what he was experiencing in the field, and how it fit with his own philosophy as an educator within the context of his relationships with his students.

Table 4.2c: Fred's reflections during the methods semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	10	F001 F005 F011 F012 F017 F023 F024 F032 F036 F037	.26	
Teacher-Social Milieu	3	F010 F022 F038	.08	
Teacher-Curriculum	0	---	---	
Student-Curriculum	9	F002 F003 F006 F007 F008 F013 F018 F019 F035	.24	
Teacher-Student	16	F004 F009 F014 F015 F016 F020 F021 F025 F026 F027 F028 F029 F030 F031 F033 F034	.42	
TOTAL	38			

There were several factors of teacher capacity that Fred did not reflect upon during the methods semester. These included: Content / subject area and curriculum / standards, both of which comprise the teacher-curriculum commonplace interaction group. The researcher concluded that this negligence could possibly point to a deficiency in Fred's development of his capacity as a teacher however, like Eva, upon reflection of all data collected, including general observations of the researcher, she was unable to find evidence that supported this idea.

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Fred's development of a critically reflective practice during the methods semester, several distinctive characteristics were seen: Fred reflected most frequently in the deliberative orientation, his higher-level reflections focused on the intrapersonal skill factor of teacher capacity, and he reflected most often on the teacher-student commonplace interaction group. Fred did not reflect at all about the teacher-curriculum commonplace interaction group.

After reviewing these results, the researcher concluded that Fred's emphasis on intrapersonal reflections consisted of combining what he had previously learned, what he was learning in methods class, his clinical field experience, and his personal philosophy all at the same time, and possibly picturing how these many variables would blend together during his student teaching semester.

Quantitative Analysis of Passages - Student Teaching Semester

By examining the types of reflection Fred used and the factors of teacher capacity he chose to reflect upon, the researcher continued to analyze Fred's patterns of reflection during the student teaching semester, and was able to identify defining characteristics of his overall development as a critically reflective practitioner.

Table 4.2d: Complexity of the reflection types used by Fred during the student teaching semester. The types of reflection are categorized into low, mid, and high.

Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	24	F047 F048 F049 F051 F052 F053 F054 F055 F056 F057 F058 F059 F060 F061 F062 F063 F064 F065 F066 F067 F068 F093 F094 F095 F096 F097 F098 F099 F100	.28		
Reflection-in and on-action	30	F045 F046 F080 F081 F082 F083 F084 F085 F086 F087 F088 F089 F090 F091 F092 F108 F109 F110 F111 F112 F113 F114 F115 F116 F117 F118 F119 F120 F121 F122	.35	High	.63
Deliberative	12	F039 F040 F050 F069 F070 F071 F072 F073 F074 F101 F102 F103	.14	Mid	.14
Personalistic	14	F041 F042 F043 F044 F075 F076 F077 F078 F079 F104 F105 F106 F107 F123	.16		
Technical	5	F026 F027 F028 F029 F030	.06	Low	.22
TOTAL	85				

Table 4.2d illustrates the orientations of reflection Fred used during student teaching. The majority of his reflections during this semester, according to passages taken from interview transcripts and participant work samples were of the reflection-in and on-action and critical orientations (Table 3.3). Fred's focus on these two orientations indicate that his level of reflection had increased, contributing to the development of his teaching practice. He continued to build theories about his teaching based on his experience, but he also considered his role within the context of his classroom, and used outside evidence

to inform and improve his practice. During an interview, the researcher asked Fred how he knew when he needed to repeat a concept. He replied,

I think they realize they know, if I'm looking for an answer from the class and nobody's getting it-- a lot of times we'll make eye contact because I know they'll have it and they'll raise their hand and say it. So they'll realize that they know what's going on: maybe I shouldn't shout it out all the time because Mr. Fred's trying to get responses from other students (F068).

The researcher noted that in this situation Fred was not only able to *make* eye contact with his students, he also noticed that this was an effective way of ensuring whether or not the students understood the concept he was teaching. Upon review of the other participants in this study, Fred is the only one who talked about making eye contact with students.

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.2e. In the higher levels of reflection, the factor of teacher capacity most reflected upon by Fred in interviews and participant work samples is that of classroom management. In an interview when the researcher and Fred were reviewing a video of his teaching, Fred made this comment:

No, I just wanted to mention, I try whenever I'm talking, because the way the room's set up, it's like two-sided. If you're looking at this side, talking to this side, it's kind of difficult to see over here to make sure they're. . . Okay, this side of the room, am I teaching to just this side of the room or am I teaching to everyone? So I think that's kind of tough for me to make sure I'm looking at everyone, I think I need to work on that (F065).

Table 4.2e: Of the high level of reflection (critical and reflection-in and on-action), Fred's reflections in the student teaching semester revealed a focus on the following factors of teacher capacity.

Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	5	F068 F092 F098 F099 F120	.08
Planning	2	F121 F122	.03
Social Responsibility	4	F049 F116 F117 F118	.07
Adaptive Expertise / Context	5	F090 F067 F091 F100 F119	.08
Content / Subject Area	4	F055 F084 F110 F111	.07
Curriculum / Standards	0	---	---
Pedagogical Content Knowledge	9	F045 F051 F052 F053 F080 F081 F082 F093 F094	.15
Constructivism / Inquiry	1	F054	.03
Real-World Application	3	F083 F108 F109	.05
Pedagogy	4	F047 F056 F057 F085	.07
Interpersonal Skills	4	F048 F058 F059 F095	.07
Knowledge of Students / Learner Diversity	1	F086	.03
Classroom Management	17	F046 F060 F061 F062 F063 F064 F065 F066 F087 F088 F089 F096 F097 F112 F113 F114 F115	.29
TOTAL	59		

It is important for the researcher to add here that the typical format for the interview when reviewing a video of a participant's teaching was for the researcher to show the participant a clip of their teaching, and ask them to explain what was happening. With Fred, this process took a different form: the researcher would scan through the video,

locating the next clip, and Fred would interrupt, asking to discuss something that had caught his eye. Fred's behavior in this situation indicated to the researcher that Fred was being a leader in his learning, and was pro-active in his critical reflection, rather than conforming to pre-established guidelines, responding to the stimulus of someone prompting him to provide a response. This is a positive trait, as it exemplifies a level of responsibility towards one practice and one that the researcher, as a teacher educator, hoped that all pre-service educators would achieve.

Table 4.2f illustrates Fred's reflections on commonplace interactions during the student teaching semester. The majority of his reflections focus on the teacher-student commonplace interaction group, which includes the factors of teacher capacity such as pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management. In a free writing journal entry, Fred commented,

After everyone completed the exam, I explained the pond water lab to the class. I was not totally comfortable explaining the lab and it showed. The class did not follow along with me when I explained field of view and microns (F096).

After reviewing general observations and field notes from this semester, the researcher concluded that Fred's comfort with the idea of critical reflection was evident by the number of reflections within this category that were extracted from his interview transcripts and participant work samples. In addition, Fred reflected on every factor of teacher capacity during this semester, illustrating that he was able to consider multiple factors of his capacity at once.

Table 4.2f: Fred's reflections during the student teaching semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	10	F068 F074 F079 F092 F098 F099 F107 F120 F121 F122	.12	
Teacher-Social Milieu	16	F043 F044 F049 F067 F076 F077 F078 F090 F091 F100 F103 F106 F116 F117 F118 F119	.19	
Teacher-Curriculum	7	F055 F069 F070 F084 F104 F110 F111	.08	
Student-Curriculum	15	F045 F050 F051 F052 F053 F054 F080 F081 F082 F083 F093 F094 F101 F108 F109	.18	
Teacher-Student	37	F039 F040 F041 F042 F046 F047 F048 F056 F057 F058 F059 F060 F061 F062 F063 F064 F065 F066 F071 F072 F073 F075 F085 F086 F087 F088 F089 F095 F096 F097 F102 F105 F112 F113 F114 F115 F123	.44	
TOTAL	85			

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Fred's development of a critically reflective practice during the student teaching semester, several distinctive characteristics were seen: Fred reflected most frequently in the reflection-in and on-action and critical orientations. In addition, his higher level reflections focused on classroom management, and he increased his number of reflections on the teacher-student commonplace interaction group. After reviewing the

results from the student teaching semester, the researcher felt that Fred's knowledge and practice of critical reflection, combined with his dispositions of leadership and confidence, facilitated his growth as a professional.

Table 4.2g: A comparison of the distinctive characteristics of Fred's reflective practice in the methods and student teaching semester.

	Methods Semester	Student Teaching Semester
Level of Reflection	Deliberative	Reflection-in and on-action Critical Reflection
High Reflection and Factor of Teacher Capacity	Intrapersonal Skills	Classroom Management
Commonplace Interaction Group Focus	Teacher-Student	Teacher-Student
Missing Factor of Teacher Capacity	Content / Subject Area Curriculum / Standards	---

By examining the data from both semesters (Table 4.2g), the researcher was able to identify several important patterns between the two semesters. Fred's level of reflection increased greatly, from deliberative during the methods semester to reflection-in and on-action and critical reflection during the student teaching semester. Fred consistently focused on the teacher-student commonplace interaction group in both semesters. Lastly, he neglected to reflect on the factors of teacher capacity comprising the teacher-curriculum commonplace interaction group during the methods semester, but reflected upon every factor of teacher capacity during the student teaching semester.

Qualitative Analysis - Teacher Capacity

As mentioned previously in this chapter, this section complements the quantitative results discussed in the first section by examining the complexity and depth of passages categorized within the framework of teacher capacity. Table 4.2h illustrates

this examination by indicating which factors of teacher capacity contained passages that increased, decreased, or stayed the same in regards to complexity and depth.

Table 4.2h: Fred's changing ability to reflect on factors of teacher capacity

	Passages Reviewed that Increased in Complexity and Depth	Passages Reviewed that Decreased in Complexity and Depth	Passages Reviewed that had no Change in Complexity and Depth
Factor of Teacher Capacity	Constructivism / Inquiry	Intrapersonal Skills	Adaptive Expertise / Context
	Pedagogy	Planning	Real World Application
	Interpersonal Skills	Pedagogical Content Knowledge	
	Knowledge of Students / Learner Diversity		
	Classroom Management		

After reviewing these results, the researcher was unable to identify any specific characteristics within field observation notes or general observations that provided an explanation for why the complexity of passages within these factors increased, decreased, or stayed the same. In addition, within the framework of teacher capacity, Fred exhibited the ability to consider multiple factors in the process of his increasing level of teacher capacity. The researcher chose not to expand upon this theme in Fred's case study, as it was already discussed in Case Study 1: Eva. In the following section (section three of this case study), Fred's development of a critically reflective practice is discussed.

Qualitative Analysis - Critical Reflection

In this section, the researcher asks the question "Did Fred's critically reflective passages increase in complexity and/or depth? By comparing critically reflective passages collected during the methods semester (n=9) with critically reflective passages collected during the student teaching semester (n=29), the researcher concluded that Fred

exhibited a positive change in his level of critical reflection. In addition to the evidence of Fred's shift from theory to practice, two additional themes in the quality of Fred's critically reflective passages in the student teaching semester were identified:

Collaboration: Several of Fred's critically reflective passages indicate that he was comfortable reflecting with others, and confident in his ability as a pre-service educator. As mentioned in a previous section, Fred made spontaneous reflective comments about his practice on several occasions while reviewing a video of his teaching with the researcher (F056, F059, F060). The researcher's general observations throughout the study support this theory of Fred's confidence, but upon a thorough search of the passages collected and field notes, the researcher was unable to find an exemplary passage to demonstrate this confidence. Fred's disposition was humble and hardworking. He was not one to be outwardly expressive in his confidence—he was confident, but did not need to let people know this through his speech. He let his actions speak for him. In summary, Fred demonstrated his ability to be proactive in his critical reflection, and confidence was one disposition he possessed, but evidence of that disposition is inexplicable by the data collected.

Metacognition: In the selected critically reflective passages, Fred frequently talked out loud about what he was thinking. He considered what would have caused a different outcome, using phrases such as “maybe that would have triggered my mind” (F053), or when he spoke about what he wants the students to think about after making a

statement, reporting “Now I want them to think.....” (F051), and verbally took responsibility for situations that may not have worked out, admitting, “I also take responsibility” (F098). Specific to this study, this was a critical trait to demonstrate as this pointed to his high level of reflection, and was exemplary of the level of thinking about one’s practice that the researcher, as a teacher educator, hoped all pre-service students would attain. These two themes seen in Fred’s behavior during critical reflection are considered by the researcher to be indicators of a critically reflective practice.

Taking Action: In addition to these two themes, an important part of Fred’s practice was that of taking action. In passages selected throughout the student teaching semester, he illustrated his ability to put this newly learned knowledge to use. For example, in an interview (October, 2008), he comments that as a result of reflecting on a lesson that did not go well because of poor time management, he has adopted a new practice; “I routinely checked the clock to allow for multiple activities”(F067). This step is important in critical reflection, as it provides feedback to the teacher about how this new practice works in the classroom (Bain, 1999).

Case Summary - Fred

In viewing Fred’s development of factors of teacher capacity, critical reflection, and commonplace interaction groups throughout the methods and student teaching semesters, several patterns were revealed. First, quantitative analyses of passages from interview transcripts and participant work samples indicated that Fred’s reflections consistently focused on the teacher-student interactions of his profession. Second,

qualitative analysis of these passages through the teacher capacity framework indicated that Fred increased his teacher capacity in the area of constructivism / inquiry, pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management. In general, Fred exhibited a shift from developing his practice based on theories in the methods semester to reflecting on his beliefs, the class context, and students in the student teaching semester, and also using outside evidence to inform and modify this teaching practice. Lastly, a second qualitative analysis of these passages through the framework of critical reflection indicated that Fred demonstrated three patterns in his critical reflections: metacognition, collaboration, and taking action.

Case Study 3: Michael

According to Michael, as long as he could remember, he had always been interested in science and mathematics. As a young child, he spent much of his free time during summer outside with his older sister's junior science kit collecting bugs and other items to look at under the microscope, or taking apart his mom's burnt out appliances hoping somehow to fix them. In school, both elementary and secondary, he always excelled in math and science, and they were always his favorite subjects. However, he was also very active and social, and this led to getting kicked out of his math class in middle school on several occasions. During these instances, he was given an algebra book, a desk in the hall, and "basically told to get after it". Throughout high school, he enjoyed math and the sciences, but really found a love for physics during his junior year. As he started to think about college, he always envisioned a career in engineering, and started college as a civil engineering student.

After his first year of college, he began to have doubts about sitting behind a desk for the rest of his life. He then worked as a counselor for a university-sponsored camp for two weeks, and found that he enjoyed interactions with children. The week after the camp ended, he changed his major to Education with an emphasis in general science broad field. "I wasn't exactly sure why at the time, but it seemed to fit much better than engineering." His first love in the sciences was physics, so after a frustrating year of earth science classes, he decided to change his major to Physics and Math, with a minor in Education. Michael said, "I really love physics. I love everything about it, especially at the introductory levels. Physics is a science that answers the questions people have about

how things work.” Michael wanted to inspire students in the same way that he had been inspired as a child. During his undergraduate years, Michael tutored students and worked as a teaching assistant for math and physics. Two aspects of education were appealing to him: teaching, and science and math content.

Quantitative Analysis of Passages - Methods Semester

All of the selected passages from interview transcripts and Michael’s work samples were coded for reflection type, and factor of teacher capacity, and commonplace interaction group.

Table 4.3a illustrates the types of reflection used by Michael during methods class. The majority of his reflections were of the deliberative orientation (Table 3.3), meaning that, Michael, like Fred and Eva, was building theories based on his experience during methods class. In a reflective summary, Michael wrote about how he could have better managed the classroom during a lesson he co-taught with another methods student: “We also could have given students questions to keep their attention while waiting to move to the next station” (M020). Later in the semester, Michael taught another lesson, and again reflected, “I think if I were to teach this lesson again, I would set aside at least 10 minutes for discussion at the end” (M036). Like Fred, Michael was building theories based on experience, but contrary to Fred, the researcher felt as though Michael was basing his theories on the methods class itself, rather than looking ahead to the student teaching semester (although this was not evident until the data from both semesters had been reviewed). The researcher concluded that this developmental factor could

potentially have held Michael back from developing a critically reflective practice during the student teaching semester.

Table 4.3a: Complexity of the reflection types used by Michael during the methods semester. The types of reflection are categorized into low, mid, and high.

	Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	9	M001 M002 M005 M009 M010 M011 M014 M019 M030	.24			
Reflection-in and on-action	6	M003 M006 M016 M022 M031 M037	.16	High	.40	
Deliberative	14	M004 M007 M008 M013 M015 M018 M020 M021 M026 M032 M034 M035 M036 M038	.37	Mid	.37	
Personalistic	6	M012 M017 M023 M024 M029 M033	.16			
Technical	3	M025 M027 M028	.08	Low	.24	
TOTAL	38					

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection) selected from interview transcripts and participant work samples are illustrated by Table 4.2b. The factor of teacher capacity most commonly reflected on by Michael was that of intrapersonal skills. In an interview, Michael talks about how he feels that this factor of teacher capacity relates to critical reflection: “So I think it’s [the video] great and I think it always brings in a new perspective from which to look at your own performance. I don’t think you can ever have

too many...” (M001). The researcher concluded that Michael was excited about, and saw the value of using external evidence to inform and improve one’s practice.

Table 4.3b: Of the high level of reflection (critical and reflection-in and on-action), Michael’s reflections in the methods semester revealed a focus on the following factors of teacher capacity.

	Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity					Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	6	M001 M003 M005 M009 M016 M019						.40
Planning	3	M002 M006 M022						.20
Social Responsibility	0	---						---
Adaptive Expertise / Context	0	---						---
Content / Subject Area	0	---						---
Curriculum / Standards	0	---						---
Pedagogical Content Knowledge	2	M011 M031						.13
Constructivism / Inquiry	0	---						---
Real-World Application	0	---						---
Pedagogy	1	M037						.07
Interpersonal Skills	0	---						---
Knowledge of Students / Learner Diversity	3	M010 M014 M030						.20
Classroom Management	0	---						---
TOTAL	15							

Table 4.3c illustrates Michael’s reflection on commonplace interactions during the methods semester. The majority of passages extracted from interview transcripts and participant work samples were focused on the teacher-self

commonplace interaction group, which includes the factors of teacher capacity such as intrapersonal skills and planning. In a reflective summary after teaching a group lab, Michael writes,

In the past, a team teaching was just another group assignment, broken into individual parts, and delivered as such. For this, I've always hated team teaching assignments. On this particular one, however, our group was much more thoughtful and critical of what we were going to teach and how we were going to approach it (M016).

This passage illustrates Michael's strong sense of teacher-self interactions as he examines his previous beliefs about working in a group. His change of perspective indicates a deep level of thinking that the researcher thought could facilitate Michael's development of a critically reflective practice.

There were many factors of teacher capacity that Michael did not reflect upon during this semester. These included: Social responsibility and adaptive expertise / context (teacher-social milieu commonplace interaction group), content / subject area and curriculum / standards (teacher-curriculum commonplace interaction group), and classroom management (teacher-student commonplace interaction group). These results are quite significant, as Michael is the only participant within this group that neglected almost one quarter of the factors of teacher capacity deemed important by the researcher to one's development as an educator. At the time this data was collected, the researcher did not give the results demonstrating Michael's neglect of these factors of teacher capacity much merit, as she felt that the results from Michael's progress in this area during student teaching would allow her to make a more accurate assessment.

Table 4.3c: Michael's reflections during the methods semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	19	M001 M002 M003 M004 M005 M006 M007 M008 M009 M013 M016 M017 M019 M022 M023 M024 M027 M029 M038	.12	
Teacher-Social Milieu	0	---	---	
Teacher-Curriculum	0	---	---	
Student-Curriculum	7	M011 M015 M018 M031 M032 M034 M035	.18	
Teacher-Student	12	M010 M012 M014 M020 M021 M025 M026 M028 M030 M033 M036 M037	.44	
TOTAL	38			

In summary, according to the passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Michael's development of a critically reflective practice during the methods semester, several distinctive characteristics were seen: Michael, like Eva and Fred, reflected most frequently in the deliberative orientation. His higher level reflections centered around intrapersonal skills, and passages selected from interview transcripts and participant work samples indicated a general focus on the teacher-self commonplace interaction groups.

After reviewing these results, the researcher concluded that Michael exhibited two behaviors that could possibly inhibit his progress during the student teaching semester.

The first, building theories based on his experience in the methods classroom, and the second, neglecting to reflect on a large number of factors of teacher capacity, illustrated to the researcher that Michael's reflective focus was limited during the methods semester.

Quantitative Analysis of Passages - Student Teaching Semester

By examining the types of reflection Michael used and the factors of teacher capacity he chose to reflect upon, the researcher continued to analyze Michael's patterns of reflection during the student teaching semester.

Table 4.3d illustrates the orientations of reflection Michael used during student teaching. The majority of his reflections during this semester, according to passages taken from interview transcripts and participant work samples were of the personalistic orientation, which means that Michael was focusing on his own personal growth and relationships with his students. In an interview, Michael commented about how he planned for a lesson: "Make sure you have something for all students to do to keep them busy. If some are granted free time while others must work, the students with free time tend to be disruptive" (M071). The researcher concluded that Michael's attempt to use best practices in this semester was evidenced by the number of reflections that focused on the personalistic orientation.

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.3e.

Table 4.3d: Complexity of the reflection types used by Michael during the student teaching semester. The types of reflection are categorized into low, mid, and high.

Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	11	M042 M051 M052 M053 M054 M055 M056 M057 M077 M078 M079	.18		
Reflection-in and on-action	8	M073 M074 M075 M076 M093 M097 M098 M099	.13	High	.31
Deliberative	18	M039 M043 M044 M045 M058 M059 M060 M061 M062 M063 M064 M065 M066 M067 M080 M081 M082 M083	.29	Mid	.29
Personalistic	19	M040 M046 M068 M069 M070 M071 M072 M084 M085 M086 M087 M088 M089 M090 M091 M092 M094 M095 M096	.31		
Technical	6	M041 M047 M048 M049 M050 M100	.10	Low	.41
TOTAL	62				

In the higher levels of reflection, the factor of teacher capacity most reflected upon by Michael in interviews and participant work samples is that of intrapersonal skills. In an interview, Michael commented about his experience as a student teacher.

I felt like there wasn't a lot of support in lesson planning and Christie wrote to me once, you're always seeking feedback, because I would. Once a week I would go and say, what did you see this week? What can I do better? What do I need to work on? Because I felt like they weren't volunteering it (M098).

The researcher felt that this situation was an example of the importance of the cooperating teacher's role in the student teaching experience, and also in the creation of a collaborative community in which critical reflection must take place (Valli, 1997).

Table 4.3e: Of the high level of reflection (critical and reflection-in and on-action), Michael's reflections in the student teaching semester revealed a focus on the following factors of teacher capacity.

Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	7	M042 M056 M057 M075 M078 M079 M098	.37
Planning	2	M076 M099	.11
Social Responsibility	0	---	---
Adaptive Expertise / Context	2	M074 M093	.11
Content / Subject Area	0	---	---
Curriculum / Standards	0	---	---
Pedagogical Content Knowledge	0	---	---
Constructivism / Inquiry	0	---	---
Real-World Application	0	---	---
Pedagogy	3	M051 M052 M073	.16
Interpersonal Skills	1	M097	.05
Knowledge of Students / Learner Diversity	3	M053 M054	.16
Classroom Management	2	M055 M077	.11
TOTAL	19		

Upon a review of the passages selected and general observations during this semester, the researcher came to the conclusion that Michael did not have adequate support from his

cooperating teachers in being critically reflective, and as a result, he resorted to thinking things out on his own. During this semester, Michael did a lot of writing in his journal.

Table 4.3f: Michael's reflections during the student teaching semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	21	M042 M045 M050 M056 M057 M067 M072 M075 M076 M078 M079 M083 M088 M089 M090 M091 M092 M095 M096 M098 M099		.12
Teacher-Social Milieu	8	M044 M049 M066 M071 M074 M087 M093 M094		.19
Teacher-Curriculum	4	M039 M040 M048 M060		.08
Student-Curriculum	11	M073 M041 M043 M046 M047 M058 M059 M068 M080 M081 M082		.18
Teacher-Student	18	M051 M052 M053 M054 M055 M061 M062 M063 M064 M065 M069 M070 M077 M084 M085 M086 M097 M100		.44
TOTAL	62			

Table 4.3f illustrates Michael's reflections on commonplace interactions during the student teaching semester. The majority of his reflections focus on the teacher-self commonplace interaction group. In an interview, Michael spoke about his philosophy:

Having that attitude about my own student teaching, like I know when I didn't do well, I know oh, this isn't so hot, I know I had a hard time keeping the students reigned in and on task today. At the end of the

day I feel like that's who I've got to answer to, myself. Some days I'm just going to be that way (M095).

After reviewing this passage and general reflections throughout this semester, the researcher arrived at an additional conclusion which was that perhaps Michael didn't want to have to answer to anyone else, and wasn't interested in collaboration. The researcher did not feel that she could competently assess which of these perspectives are more accurate without future research.

In summary, according to the passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that seemed to impact Michael's development of a critically reflective practice during the student teaching semester, several distinctive characteristics were seen: Michael relied most frequently on the "personalistic" orientation of reflection, and his higher level reflections focused on intrapersonal skills. Lastly, he reflected most frequently on the teacher-self commonplace interaction group. The factors of teacher capacity that Michael did not reflect upon during the student teaching semester included: content / subject area (teacher-curriculum commonplace interaction group), and constructivism / inquiry and real-world application (student-curriculum commonplace interaction group).

By examining the data from both semesters (Table 4.3g), the researcher was able to identify several important patterns between the two semesters. Michael's level of reflection shifted with the environment in which he was teaching; in the methods semester, the curriculum was centered on peer feedback and deliberative reflection.

Table 4.3g: A comparison of the distinctive characteristics of Michael's reflective practice in the methods and student teaching semester.

	Methods Semester	Student Teaching Semester
Level of Reflection	Deliberative	Personalistic
High Reflection and Factor of Teacher Capacity	Intrapersonal Skills	Intrapersonal Skills
Commonplace Interaction Group Focus	Teacher-Self	Teacher-Self
Missing Factor of Teacher Capacity	Social Responsibility Adaptive Expertise / Context Content / Subject Area Curriculum / Standards Classroom Management	Content / Subject Area Constructivism / Inquiry Real World Application

In the student teaching semester, the researcher concluded that it was necessary for Michael to reflect on his relationships with students, as they are what comprised the majority of his occupation. His high levels of reflection remained consistent, as Michael reflected most critically upon himself during both semesters, this pattern being repeated in the commonplace interaction group upon which he focused most frequently-- the teacher-self group. Lastly, Michael reflected on a higher number of factors of teacher capacity during the student teaching semester, suggesting a slight increase in teacher capacity.

Qualitative Analysis - Teacher Capacity

As mentioned previously in this chapter, this section complements the quantitative results discussed in the first section by examining the complexity and depth of passages categorized within the framework of teacher capacity. Table 4.3h illustrates this examination by indicating which factors of teacher capacity contained passages which increased, decreased, or stayed the same in regards to complexity and depth.

Table 4.3h: Michael's changing ability to reflect on factors of teacher capacity

Factor of Teacher Capacity	Passages Reviewed that Increased in Complexity and Depth	Passages Reviewed that Decreased in Complexity and Depth	Passages Reviewed that had no Change in Complexity and Depth
	Planning	Intrapersonal Skills	Knowledge of Students / Learner Diversity
	Pedagogical Content Knowledge		
	Content / Subject Area		

The researcher felt that it was important to note here that there are very few factors of teacher capacity in Table 4.3h, due to the factors upon which Michael did not reflect during the methods semester. In general, Michael's passages reflect the shift from theory (in the methods semester) to practice (in the student teaching semester), evidenced by the increasing specificity of his passages; the passages become more specific to the group of students and the environment in which he was teaching. As an example of this, the researcher was also able to identify a difference in Michael's passages between "knowing" (illustrated by passage M021) in the methods semester, and "understanding" (illustrated by passage M052) in the student teaching semester. There is one theme that the researcher identified in the content / subject area factor of teacher capacity that could possibly be an indicator of Michael's increasing capacity as a teacher: the use of previously-learned concepts in a new environment.

Using Prior Knowledge in a New Context: In the content / subject area factor of teacher capacity, Michael demonstrates a method of meta-cognition (concept mapping) taught to him in the methods class as a way to prepare and connect major ideas. In a free writing journal entry, he demonstrated his concern with student learning when he wrote, "a concept map might help the students see the connections between these concepts"

(M080). He also used concept mapping as a way to see connections for himself in preparing to teach the content of the lesson. Michael's ability to use prior knowledge in a new situation indicates a higher level of understanding, of both the content area and the context in which he is teaching. In the following section, section three of this case study, Michael's development of a critically reflective practice is discussed.

Qualitative Analysis - Critical Reflection

In this section, the researcher asks the question "Did Michael's critically reflective passages increase in complexity and/or depth? By comparing critically reflective passages collected during the methods semester (n=10) with critically reflective passages collected during the student teaching semester (n=12), the researcher concluded that Michael did not increase his level of critical reflection. The pattern of Michael's shift from theory (in the methods semester) to practice (in the student teaching semester) described in the previous section was evident only by the specific references to the issues in the classroom or school. He did not readily reflect on videos of his teaching, and did not reflect on what he learned from reviewing student work. In summary, Michael accurately assessed his strengths and weaknesses, but he did not use outside evidence in a timely way to improve his practice, and it is not evident from the passages that were examined that he incorporated or planned to incorporate what he learned into his future lessons.

Case Summary – Michael

In viewing Michael's development of factors of teacher capacity and critical reflection throughout the methods and student teaching semesters, several patterns are evident. First, quantitative analysis of passages from interview transcripts and participant work samples indicated that Michael's focus on critical reflection was consistently internal (intrapersonal) throughout both semesters, and especially during the methods semester he seemed limited in his ability to reflect on many variables at once. In addition, qualitative analysis of these passages through the teacher capacity framework indicated that he increased his complexity of reflection on the factors of teacher capacity such as planning and pedagogical content knowledge. In these areas, Michael demonstrated the ability to use prior knowledge in a new context, which was identified by the researcher as a theme that is indicative of this increase in Michael's capacity as an educator. Lastly, a second qualitative analysis of these passages through the framework of critical reflection indicated that Michael did not increase in his use of critical reflection, and he consistently did not reflect upon the content / subject area factor of teacher capacity.

Case Study 4: Sarah

From the time Sarah was a little girl, she always knew she wanted to be a teacher. Her father was a professor at the local university, and on her days off from school, she would go to class with him. He has always been one of her greatest influences. Though she knew she wanted to teach, she wasn't sure what kind of teacher she wanted to be until her sophomore year in high school, when Sarah took her first chemistry class. At that point, she knew that she wanted to be a chemistry teacher.

Sarah's father had always been a mentor to her. The first time she sat in his classroom and saw how he interacted with his students, she wanted even more to become a teacher. His students were laughing with him and participating with the lecture he was giving, "even though I had no idea what he was talking about" she admits. She learned from him that teaching was more than giving people information, and learning was more than just reading a book and trying to remember something. She explains, "My dad showed me that learning could be fun, and if you are the right kind of teacher, learning anything was possible".

Quantitative Analysis of Passages - Methods Semester

All of the selected passages from interview transcripts and Sarah's work samples were coded for reflection type, factor of teacher capacity, and commonplace interaction group.

Table 4.4a illustrates the types of reflection used by Sarah during methods class. The majority of her reflections were of the deliberative and reflection-in and on-action

orientation, meaning that like the other participants, Sarah was building theories about her teaching practice based on her experiences during the methods semester. In a reflective summary, Sara wrote about how her experience would impact her future planning: “I think the next time this lesson is taught, I will have the students actually heat the magnesium to see for themselves that the reaction actually does take place and the law of constant composition actually does exist” (Sa36).

Table 4.4a: Complexity of the reflection types used by Sarah during the methods semester. The types of reflection are categorized into low, mid, and high.

	Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code						Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	5	Sa10 Sa11 Sa17 Sa22 Sa30							.12		
Reflection-in and on-action	13	Sa05 Sa06 Sa08 Sa09 Sa16 Sa18 Sa19 Sa20 Sa21 Sa34 Sa35 Sa40 Sa41							.32	High	.31
Deliberative	15	Sa01 Sa02 Sa03 Sa04 Sa07 Sa12 Sa13 Sa14 Sa23 Sa29 Sa31 Sa36 Sa37 Sa38 Sa39							.37	Mid	.29
Personalistic	5	Sa15 Sa24 Sa25 Sa32 Sa33							.12		
Technical	3	Sa26 Sa27 Sa28							.07	Low	.41
TOTAL	41										

Almost all of Sarah’s reflections in these two orientations focused on reflecting on her teaching practice and what she would plan to do next time. However, upon reviewing these passages and general observations from the semester, the researcher concluded that like Michael before her, Sarah was building theories based on teaching in a methods

classroom, rather than considering multiple perspectives of her development, as Fred had demonstrated. The researcher also concluded that, like Michael, Sarah too may potentially have been disadvantaged by this theory-building practice, as Sarah and Michael would not be student teaching in a college classroom, but in a high school.

Table 4.4b: Of the high level of reflection (critical and reflection-in and on-action), Sarah's reflections in the methods semester revealed a focus on the following factors of teacher capacity.

Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	3	Sa21 Sa30 Sa41	.17
Planning	0	---	---
Social Responsibility	0	---	---
Adaptive Expertise / Context	1	Sa22	.06
Content / Subject Area	1	Sa34	.06
Curriculum / Standards	0	---	---
Pedagogical Content Knowledge	8	Sa05 Sa06 Sa08 Sa09 Sa10 Sa16 Sa17 Sa40	.44
Constructivism / Inquiry	3	Sa18 Sa19 Sa20	.17
Real-World Application	1	Sa11	.06
Pedagogy	1	Sa35	.06
Interpersonal Skills	0	---	---
Knowledge of Students / Learner Diversity	0	---	---
Classroom Management	0	---	---
TOTAL	18		

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection) selected from interview transcripts and participant work samples are illustrated by Table 4.4b. The factor of teacher capacity most commonly reflected on by Sarah was that of pedagogical content knowledge. In a reflective summary, she writes about this aspect of her planning; “The next time I do this demonstration, I will bring in a model kit and show how the molecules interact, as well as draw them on the board” (Sa08). This passage illustrates the great amount of thought that Sarah was devoting towards finding alternative ways to present the content. The researcher’s general observations of Sarah during the methods semester was that Sarah reinforced her interest in this factor of teacher capacity, because during the methods semester, she was consistently looking for resources that would help her to best explain the concepts at hand. Sarah was particularly interested in finding and creating inquiry lessons to use with a chemistry classroom.

Table 4.4c illustrates Sarah’s reflection on commonplace interactions during the methods semester. The majority of passages extracted from interview transcripts and participant work samples were focused on the student-curriculum commonplace interaction group. This also reinforces the previous conclusions drawn by the researcher about Sarah’s interest in finding ways to present the content to her students. In an interview, Sarah comments,

So they’ll actually see what happens and understand why it happens and what the purpose of it is. And the same with like batteries and stuff we can talk about it using thermodynamics, but what does that really mean to them (Sa13).

This passage demonstrates that Sarah was indeed focused on finding a meaningful way to teach her students about chemistry.

Table 4.4c: Sarah's reflections during the methods semester, analyzed by commonplace interaction group.

Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	6	Sa21 Sa25 Sa28 Sa29 Sa30 Sa41	.14
Teacher-Social Milieu	4	Sa04 Sa22 Sa24 Sa27	.10
Teacher-Curriculum	5	Sa02 Sa03 Sa14 Sa32 Sa34	.12
Student-Curriculum	21	Sa01 Sa05 Sa06 Sa07 Sa08 Sa09 Sa10 Sa11 Sa12 Sa13 Sa16 Sa17 Sa18 Sa19 Sa20 Sa23 Sa31 Sa36 Sa37 Sa38 Sa40	.50
Teacher-Student	5	Sa15 Sa26 Sa33 Sa35 Sa39	.12
TOTAL	42		

There were several factors of teacher capacity that Sarah did not reflect upon during this semester. These included: Social responsibility (teacher-social milieu commonplace interaction group), and curriculum / standards (teacher-curriculum commonplace interaction group). After a review of these results, the researcher found it curious that although Sarah was very interested in effectively getting the content across to students, she did not reflect at all on the curriculum / standards factor of teacher capacity.

The researcher was unable to find an explanation for this within the data she had collected.

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Sarah's development of a critically reflective practice during the methods semester, several distinctive characteristics were seen: Sarah's levels of reflection focused on the deliberative and reflection-in and on-action orientations. Her higher level reflections focused on the pedagogical content knowledge factor of teacher capacity, but she did not reflect at all on the curriculum and standards that guided what was necessary to teach students in a chemistry classroom. Lastly, she focused upon the student-curriculum commonplace interaction group.

Quantitative Analysis of Passages - Student Teaching Semester

By examining the types of reflection Sarah used and the factors of teacher capacity she chose to reflect upon, the researcher continued to analyze Sarah's patterns of reflection during the student teaching semester.

Table 4.4d illustrates the type of reflection Sarah used during student teaching. The majority of her reflections during this semester, according to passages taken from interview transcripts and participant work samples were of the deliberative and critical orientations, which means that Sarah continued to build theories about the practice of education through her experience as a student teacher. For example, in a free writing journal entry, Sarah comments, "It seems like students pay more attention when they are

interested in what is going on. I think lots of interactive activities should be done in the classroom to promote student involvement” (Sa49).

Table 4.4d: Complexity of the reflection types used by Sarah during the student teaching semester. The types of reflection are categorized into low, mid, and high.

Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	14	Sa44 Sa67 Sa68 Sa69 Sa70 Sa71 Sa72 Sa73 Sa74 Sa77 Sa78 Sa79 Sa80 Sa81	.30		
Reflection-in and on-action	11	Sa57 Sa58 Sa59 Sa60 Sa61 Sa62 Sa63 Sa64 Sa65 Sa66 Sa88	.23	High	.53
Deliberative	14	Sa42 Sa43 Sa45 Sa46 Sa47 Sa48 Sa49 Sa50 Sa75 Sa82 Sa83 Sa84 Sa85 Sa86	.30	Mid	.30
Personalistic	8	Sa51 Sa52 Sa53 Sa54 Sa55 Sa56 Sa76 Sa87	.17		
Technical	0	---	---	Low	.17
TOTAL	47				

Sarah also reflected critically upon her practice, using outside evidence to inform and modify her teaching. During an interview, she assessed her teaching with the researcher, based on a sample of student work:

Well one [test] says that I’m a pretty good teacher and the other one, not so much. But I don’t know if it’s the way they learn, if I’m not implementing enough different learning styles, maybe need more demos, more time in the labs, so visual people can actually see it instead of just hear it (Sa80).

Table 4.4e: Of the high level of reflection (critical and reflection-in and on-action), Sarah's reflections in the student teaching semester revealed a focus on the following factors of teacher capacity.

	Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	12	Sa44 Sa65 Sa69 Sa70 Sa71 Sa72 Sa73 Sa78 Sa79 Sa80 Sa81 Sa88		.48
Planning	2	Sa66 Sa74		.08
Social Responsibility	0	---		---
Adaptive Expertise / Context	1	Sa68		.04
Content / Subject Area	0	---		---
Curriculum / Standards	1	Sa77		.04
Pedagogical Content Knowledge	2	Sa57 Sa58		.08
Constructivism / Inquiry	2	Sa59 Sa67		.08
Real World Application	0	---		---
Pedagogy	0	---		---
Interpersonal Skills	0	---		---
Knowledge of Students / Learner Diversity	1	Sa60		.04
Classroom Management	4	Sa61 Sa62 Sa63 Sa64		.16
TOTAL	25			

The researcher found it interesting that Sarah continued to reflect in the deliberative orientation, as she is the only participant who continued to implement this orientation of reflection (initially established in the methods class) as a major part of their reflective practice. The passages that were included in the highest level of reflection (reflection-in

and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.4e.

In the higher levels of reflection, the factor of teacher capacity most reflected upon by Sarah in interview transcripts and participant work samples is that of intrapersonal skills. In an interview, Sarah admitted that she noticed sometimes her temper was short with the students she taught: “Once I have to repeat something about five or six times, then I start getting frustrated and I get crabby” (Sa70). Sarah’s willingness to admit something not very positive about her disposition was refreshing to the researcher, and also indicated that Sarah was comfortable with herself *and* the researcher at a level that allowed her to share this information.

Table 4.4f illustrates the reflections on commonplace interactions during the student teaching semester. The majority of her reflections focus on the teacher-self and the teacher-student commonplace interaction group. Considering this result, the researcher felt that Sarah’s focus on these two groups could be a result (or a factor) of her choice of reflection orientation. The researcher made an additional inquiry into the data that was collected, and discovered that of the 16 passages categorized in the teacher-self commonplace interaction group, 11 of them were also categorized as critically reflective. There were no passages in this group that were categorized as deliberately reflective. In addition, of the 14 passages categorized in the teacher-student commonplace interaction group, seven were deliberately reflective, and none of the passages were critically reflective. The researcher concluded that during the student teaching semester, Sarah was

reflecting deliberately on her interactions with the students, and critically in her interactions with her thoughts.

Table 4.4f: Sarah's reflections during the student teaching semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	16	Sa44 Sa56 Sa65 Sa66 Sa69 Sa70 Sa71 Sa72 Sa73 Sa74 Sa76 Sa78 Sa79 Sa80 Sa81 Sa88		.33
Teacher-Social Milieu	6	Sa52 Sa53 Sa54 Sa55 Sa68 Sa86		.13
Teacher-Curriculum	2	Sa77 Sa84		.04
Student-Curriculum	9	Sa45 Sa46 Sa57 Sa58 Sa59 Sa67 Sa75 Sa82 Sa83		.19
Teacher-Student	14	Sa42 Sa43 Sa48 Sa47 Sa49 Sa50 Sa51 Sa60 Sa61 Sa62 Sa63 Sa64 Sa85 Sa87		.29
TOTAL	48			

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Sarah's development of a critically reflective practice during the student teaching semester, several distinctive characteristics were seen: the majority of Sarah's level of reflection was equally distributed between critical reflection and deliberative reflection: her high-level reflections focused on the intrapersonal skill factor of teacher

capacity; and the majority of her reflections on her interactions as a teacher were equally split between her intrapersonal interactions and her interactions with her students. The researcher concluded that Sarah was reflecting critically on her intrapersonal interactions and deliberatively on her teacher-student, or interpersonal interactions. During this semester, Sarah did not reflect at all on the content / subject area factor of teacher capacity.

Table 4.4g: A comparison of the distinctive characteristics of Sarah's reflective practice in the methods and student teaching semester.

	Methods Semester	Student Teaching Semester
Level of Reflection	Deliberative Reflection	Deliberative Reflection Critical Reflection
High Reflection and Factor of Teacher Capacity	Pedagogical Content Knowledge	Intrapersonal Skills
Commonplace Interaction Group Focus	Student-Curriculum	Teacher-Self Teacher-Student
Missing Factor of Teacher Capacity	Social Responsibility Curriculum / Standards	Content / Subject Area

By examining the data from both semesters (Table 4.4g), the researcher was able to locate several important patterns between the two semesters. First, Sarah's level of reflection remained the same from one semester to the next, and like Fred, she focused on two major orientations of reflection during the student teaching semester. The researcher concluded that Sarah could have possibly been naturally drawn to the type of reflection that would best serve her needs for the environment of student teaching, but a clear conclusion about this could only be reliably drawn with further research. Second, her higher level reflections focused on pedagogical content knowledge (student-curriculum

commonplace interaction group) and intrapersonal skills (teacher-self commonplace interaction group).

Qualitative Analysis - Teacher Capacity

As mentioned previously in this chapter, this section complements the quantitative results discussed in the first section by examining the complexity and depth of passages categorized within the framework of teacher capacity. Table 4.4h illustrates the results of this examination by indicating which factors of teacher capacity contained passages which increased, decreased, or remained the same.

Table 4.4h: Sarah's changing ability to reflect on factors of teacher capacity

	Passages Reviewed that Increased in Complexity and Depth	Passages Reviewed that Decreased in Complexity and Depth	Passages Reviewed that had no Change in Complexity and Depth
Factor of Teacher Capacity	Constructivism / Inquiry	Adaptive Expertise / Context	Pedagogical Content Knowledge
	Real-World Application		
	Pedagogy		
	Interpersonal Skills		
	Knowledge of Students / Learner Diversity		
	Classroom Management		

In general, the passages examined during Sarah's student teaching semester showed greater depth and complexity when compared to the methods semester passages. Sarah shifted her focus from knowing the concepts of constructivism / inquiry, real-world application, pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management in the methods semester, to beginning to implement these practices in her own student teaching classroom. It is obvious that Sarah is considering

what would work best for each class. However, after reviewing the passages that were collected, the researcher concluded that Sarah did not show evidence of relating to her students as individuals. For example, in a free writing journal entry, Sarah vents,

The students were given a mock example for the lab so they would know how to complete the lab. They filled out their lab reports with the fake info. I tried to hold their hand through the lab, but still failed. I think I should have majored in elementary education, just so I would have the right mindset to teach these students that are in high school (Sa63).

While Sarah's display of her impatience with these students did not seem to impact her capacity as a teacher, or her development of a critically reflective practice, the researcher could not help but to make a note of these references made by Sarah, because when combined with the researcher's general observations of Sarah, the researcher was left to question whether or not Sarah would indeed find happiness in a future of teaching high school. In the following section, section three of this case study, Sarah's development of a critically reflective practice is discussed.

Qualitative Analysis - Critical Reflection

In this section, the researcher asks the question "Did Sarah's critically reflective passages increase in complexity and/or depth? By comparing critically reflective passages collected during the methods semester (n=5) with critically reflective passages collected during the student teaching semester (n=14), the researcher concluded that Sarah had increased her level of critical reflections, based on the increasing complexity and depth of her passages during the student teaching semester. Specifically, Sarah used outside evidence of student comments, behavior (illustrated by passage Sa67), and work samples (illustrated by passage Sa79) to inform her practice. However, according to the

field notes taken in November 2008 (Appendix K), when the researcher interviewed Sarah mid-way through the semester, she exhibited behavior that was not representative of a person who had truly developed a critically reflective practice.

Case Summary - Sarah

In viewing Sarah's development of factors of teacher capacity and critical reflection throughout the methods and student teaching semesters, several patterns are evident. First, quantitative analysis of passages from interview transcripts and participant work samples indicated that Sarah chose the type of reflection most conducive to what she was thinking about as she increased her capacity as a teacher, exhibited by her choice of reflection orientation in the methods semester and the student teaching semester. In addition, qualitative analysis of these passages through the teacher capacity framework and the critical reflection framework indicated that her level of teacher capacity and critical reflection increased, evidenced by the increasing complexity and depth of topics and thoughts discussed in the passages from the student teaching semester. However, some of the researcher's observations of Sarah's behavior during this semester did not support this increase of teacher capacity and critical reflection. As a result, the researcher concluded that Sarah did increase in her capacity as a teacher, as well as her ability to critically reflect: however, there were some factors that inhibited Sarah's progress. Additional research would need to be conducted with this participant to gain an even more in-depth perspective of this result to draw an accurate conclusion of Sarah's practice during this time.

Case Study 5: Stephanie

Stephanie chose to teach biology because she thought it was one of the most interesting and fascinating concepts. She commented, “Biology is everywhere. It is who we are as humans, what organisms exist and why, how processes occur, and it continues to change everyday”. She felt that in particular, a potential biology educator must be a strong teacher and one who enjoyed challenges. In that respect, Stephanie felt qualified to be an exceptional biology teacher. She loved challenges, finding ways to relate biology to the lives of her students, and wanted to help students learn and develop their knowledge. She explained,

I believe students are amazing creatures striving to learn and are willing to go above and beyond what is expected. Students just need help getting started and as a teacher, I will be there to guide them along the way.

It was Stephanie’s goal to make biology fun and exciting for her students, and to instill a sense of pride and purpose in their school experience.

In her past experiences of working with students, she had felt a sense of accomplishment and pride not only from reaching her goals, but also from seeing the finished product or idea that came from assisting students. She loved to see students strive in education, reach their goals, and grow as individuals. She looked forward to working as a positive team member along with students, parents, teachers, and the community, to prepare students for their future.

Quantitative Analysis of Passages - Methods Semester

All of the selected passages from interview transcripts and Stephanie's work samples were coded for reflection type, factor of teacher capacity, and commonplace interaction group.

Table 4.5a illustrates the types of reflection used by Stephanie during methods class. The number of passages analyzed within the framework of orientations of reflection produced an interesting result: Stephanie reflected almost equally in the critical, deliberative, personalistic, and technical orientations.

Table 4.5a: Complexity of the reflection types used by Stephanie during the methods semester. The types of reflection are categorized into low, mid, and high.

Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	8	St01 St03 St08 St10 St14 St22 St24 St32	.24		
Reflection-in and on-action	4	St11 St16 St17 St23	.12	High	.36
Deliberative	7	St05 St06 St09 St12 St13 St15 St18	.21	Mid	.21
Personalistic	7	St02 St04 St07 St27 St28 St29 St33	.21		
Technical	7	St19 St20 St21 St25 St26 St30 St31	.21	Low	.42
TOTAL	33				

The researcher concluded that this broad spectrum of reflection orientations that Stephanie utilized in the methods semester was representative of the curriculum that was

implemented in the methods class. One example of a particular meaningful passage, seen in a structured journal response, illustrates Stephanie's focus on the social responsibility factor of teacher capacity:

I have seen a big change in some students' attitudes since I started here a couple months ago. The other day, two senior students called an assembly for the whole school. They had conducted a survey on respect in the school. They told students that something needed to change and it is a privilege to go to Bridger! I think this really touched the teachers and students! (St14)

This passage illustrates Stephanie's thought process about her clinical field experience in an alternative high school, where she was introduced to the social and ethical perspective of educating children.

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection) selected from interview transcripts and participant work samples are illustrated by Table 4.5b. The factor of teacher capacity most commonly reflected on by Stephanie was that of social responsibility. In a structured journal response, Stephanie writes, "Sally [my cooperating teacher] also has shown me how to be flexible with lesson plans, have less structured class, and create different learning experiences for different students"(St24). Prior to the clinical field experience, Stephanie had not been exposed to high school students who were struggling in a traditional school setting, nor had she worked with, or had friends in high school that represented this population. The researcher concluded that Stephanie could have reflected most frequently on this factor of teacher capacity because it was such a new situation for her, but a more reliable explanation would need to be supported by additional research with this participant.

Table 4.5b: Of the high level of reflection (critical and reflection-in and on-action), Stephanie's reflections in the methods semester revealed a focus on the following factors of teacher capacity.

	Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	2	St01 St11		.17
Planning	1	St17		.08
Social Responsibility	4	St10 St14 St24 St32		.33
Adaptive Expertise / Context	0	---		---
Content / Subject Area	0	---		---
Curriculum / Standards	0	---		---
Pedagogical Content Knowledge	0	---		---
Constructivism / Inquiry	1	St16		.08
Real-World Application	0	---		---
Pedagogy	2	St03 St23		.17
Interpersonal Skills	0	---		---
Knowledge of Students / Learner Diversity	2	St08 St22		.17
Classroom Management	0	---		---
TOTAL	12			

Table 4.5c illustrates Stephanie's reflection on commonplace interactions during the methods semester. Again, the majority of her reflections resulted in passages categorized by the teacher-social milieu commonplace interaction group. Included in this group is the adaptive expertise / context aspect of teacher capacity. This factor is illustrated by a comment made by Stephanie in an interview, when the researcher asked her about her teaching style:

And even when it gets to student teaching, you can work on it, it doesn't mean that it has to change right away. I think it's more of a progression. You know, you start more structured, and if you see what works better, you can learn how to change with it (St02).

Stephanie's comfort level with the changing nature of her future classroom, her professional development, and the changing context in which she would need to teach illustrated to the researcher that Stephanie, like Eva, seemed to have a broad sense of what she was being taught, and how it would relate to her professional responsibility during the student teaching semester.

There were several factors of teacher capacity that Stephanie did not reflect upon during this semester. Similar to several of the other participants, these neglected factors included: content / subject area and curriculum / standards (teacher-curriculum commonplace interaction group) and classroom management (teacher-student commonplace interaction group). The researcher felt that Stephanie's neglect of reflection upon the teacher-curriculum interactions could possibly be a deficit to her during the student teaching semester, but chose not make an assessment about these neglected factors until after the student teaching semester. Fortunately, Stephanie focused her higher-level reflections on classroom management during the student teaching semester, and the researcher concluded that there was not a need for concern about Stephanie's development regarding this factor of teacher capacity.

Table 4.5c: Stephanie's reflections during the methods semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group		Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	3	St04 St09 St17			.09
Teacher-Social Milieu	15	St02 St10 St12 St14 St19 St20 St21 St24 St27 St28 St29 St30 St31 St32 St33			.43
Teacher-Curriculum	0	---			---
Student-Curriculum	5	St06 St15 St16 St25 St26			.14
Teacher-Student	10	St01 St03 St05 St07 St08 St11 St13 St18 St22 St23			.29
TOTAL	33				

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Stephanie's development of a critically reflective practice during the methods semester, several distinctive characteristics were seen: Stephanie's orientations of reflection were equally distributed among all levels, and her higher level reflections focused on the social responsibility factor of teacher capacity. In general, she reflected most often on the factors of teacher capacity associated with the teacher-social milieu commonplace interaction group, and Stephanie did not focus at all on the factors of teacher capacity such as content / subject area and curriculum / standards.

Quantitative Analysis of Passages - Student Teaching Semester

By examining the types of reflection Stephanie used and the factors of teacher capacity she chose to reflect upon, the researcher continued to analyze Stephanie's patterns of reflection during the student teaching semester.

Table 4.5d illustrates the type of reflection Stephanie used during student teaching. The majority of her reflections during this semester, according to passages taken from interview transcripts and participant work samples were of the "reflection-in and on-action" and "personalistic" orientations, which meant that Stephanie focused both on her ability to make and justify good decisions based on her own unique situation, and her personal growth and relationships with her students. In a free writing journal entry, Stephanie gives an example of her justifying her decisions based on her unique situation:

We did have some problems with a couple students in Zoology. Along with using their phone during the test, we found that some students were copying each others' homework or labs exactly. The two assignments had the exact same answers. We had to talk to them and explain why cheating is unacceptable. They acted very rude and did not respect us as teachers (St64).

Although it may not be evident from this particular passage, this passage is one of many (St61, St62, St63, St65, St67) in which Stephanie describes a situation needing behavior management, and how she solved it. Throughout this semester, Stephanie had to deal with an abundance of classroom management issues, and upon the researcher's own reflection, she did not recall Stephanie ever being perplexed, doubtful, or unsure of what she had done to "correct" the behavior. This result is important, because although Stephanie's reflections are solution-based, they are not representative of critical thought.

An example of a passage written by Stephanie that exemplifies the personalistic orientation of reflection can be seen in a free writing journal entry, where Stephanie writes,

I am very comfortable in my classes and feel like I am getting to know my individual students pretty well. I have noticed those who are struggling academically but are truly trying, those who don't turn in assignments, those who are excelling, and those who need an extra push along the way (St46).

In this passage, Stephanie describes her relationship with her students as one where she knows them as individuals. However, the previous passage suggests that she is doing something that is not effective regarding classroom management, and from the researcher's general observations, she draws the conclusion that Stephanie is *not* really seeing her students as individuals. After reviewing these sources of data, which produced conflicting results, the researcher relied on Stephanie's low frequency of critically reflective passages during this semester to determine that although Stephanie felt that she was relating to the students as individuals, there was no other way to accurately assess her practice, other than critical reflection (relying on peer feedback, video, or student responses). Because Stephanie did not engage in that type of reflection during this semester, the researcher concluded that Stephanie inaccurately assessed her teaching practice.

The passages that were included in the highest level of reflection (reflection-in and on-action and critical reflection), selected from interview transcripts and participant work samples are displayed in Table 4.5e.

Table 4.5d: Complexity of the reflection types used by Stephanie during the student teaching semester. The types of reflection are categorized into low, mid, and high.

	Reflection Orientation of Passage	Number of Passages in Orientation of Reflection	Appendix Referenced by Passage Code	Percent of Passages by Orientation of Reflection	Level of Reflection	Combined Percentage by Level of Reflection
Critical	2	St40 St95		.03		
Reflection-in and on-action	30	St38 St39 St54 St55 St56 St57 St58 St59 St60 St61 St62 St63 St64 St65 St66 St67 St68 St81 St82 St83 St84 St85 St86 St87 St90 St91 St92 St93 St94 St97		.47	High	.50
Deliberative	12	St41 St42 St43 St69 St70 St71 St72 St73 St74 St75 St88 St89		.19	Mid	.19
Personalistic	20	St34 St35 St36 St37 St44 St45 St46 St47 St48 St49 St50 St51 St52 St53 St76 St77 St78 St79 St80 St96		.31		
Technical	0	---		.00	Low	.31
TOTAL	64					

In the higher levels of reflection, the factor of teacher capacity most reflected upon by Stephanie in interview transcripts and participant work samples is that of classroom management. In an interview, when reviewing a video of Stephanie's teaching, the researcher asked her to describe a disruptive situation. Stephanie explains,

And he was doing something, I noticed that all the kids started looking out the window. So I was going to go over there and see what was going on and then I saw the kid run away. So then, it always after it happens, the kids start laughing and then things. . . I want to make sure [I said] 'yeah you got distracted, so let's get back on to the lesson'. So that's what happened there (St90).

Table 4.5e: Of the high level of reflection (critical and reflection-in and on-action), Stephanie's reflections in the student teaching semester revealed a focus on the following factors of teacher capacity.

	Factor of Teacher Capacity	Number of Passages in Factor of Teacher Capacity	Appendix Referenced by Passage Code	Percent of Reflections by Teacher Capacity Factor
Intrapersonal Skills	2	St40 St58		.06
Planning	5	St39 St86 St87 St94 St97		.16
Social Responsibility	3	St65 St83 St84		.09
Adaptive Expertise / Context	6	St66 St67 St68 St85 St92 St93		.19
Content / Subject Area	1	St57		.03
Curriculum / Standards	1	St95		.03
Pedagogical Content Knowledge	3	St54 St81 St82		.09
Constructivism / Inquiry	0	---		---
Real-World Application	2	St55 St56		.06
Pedagogy	0	---		---
Interpersonal Skills	0	---		---
Knowledge of Students / Learner Diversity	1	St38		.03
Classroom Management	8	St59 St60 St61 St62 St63 St64 St90 St91		.25
TOTAL	32			

In this situation, the researcher felt that Stephanie fell for a very easily-avoided problem: Students were looking out the door at another student in the hallway, and Stephanie let her attention stray from her students to the distraction in the hall. Then the student in the hall ran away, and the class laughed. In addition, upon asking Stephanie about this,

Stephanie did not seem to think there was anything wrong with how she addressed this situation. Perhaps, if Stephanie had relied more on critical reflection, she might have concluded otherwise, as well as addressing other classroom behavioral issues in a more effective manner.

Table 4.5f illustrates the reflections on commonplace interactions made by Stephanie during student teaching. The majority of her reflections focus on the teacher-social milieu commonplace interaction group, which indicates that she was frequently reflecting upon her the social responsibility and adaptive expertise / context factors of teacher capacity. In an interview, Stephanie explains this change in her capacity as an educator.

The biggest change in my knowledge, skills and beliefs as a teacher from methods class to now is definitely seeing the whole picture, like in methods you're not there, you're practicing it, you're not seeing the whole picture, you're not seeing the community that you're in, and now like seeing how teaching actually is, how it does take a lot of work, you do have to pan ahead, you do have to have multiple strategies for individual students, you do have to be a cooperating teacher with other teachers. I've definitely seen the big picture and I've definitely learned how to be prepared and plan ahead and how to interact with other teachers (St96).

The way Stephanie interacted with her fellow science teachers, and the initiative she took in working hard at what she was doing was unsurpassed among all of the participants. The community in which she was placed was not only supportive of her developing professional skills, but they also inquired frequently into the learning of the students, which resulted in creating a community to which Stephanie adapted quickly.

Table 4.5f: Stephanie's reflections during the student teaching semester, analyzed by commonplace interaction group.

	Commonplace Interaction Group	Number of Passages by Commonplace Interaction Group	Appendix Referenced by Passage Code	Percent of Reflections Done on this Commonplace Interaction Group
Teacher-Self	9	St34 St39 St45 St79 St80 St86 St87 St94 St97		.14
Teacher-Social Milieu	16	St37 St42 St43 St52 St53 St65 St66 St67 St68 St74 St83 St84 St85 St92 St93 St96		.25
Teacher-Curriculum	2	St57 St95		.03
Student-Curriculum	9	St41 St54 St55 St56 St69 St70 St81 St82 St88		.14
Teacher-Student	28	St35 St36 St38 St40 St44 St46 St47 St48 St49 St50 St51 St58 St59 St60 St61 St62 St63 St64 St71 St72 St73 St75 St76 St77 St78 St89 St90 St91		.44
TOTAL	64			

During this semester, Stephanie did not reflect at all on the constructivism / inquiry (student-curriculum commonplace interaction group), and the pedagogy, and interpersonal skills (teacher-student commonplace interaction group) factors of teacher capacity. The researcher found this curious, that Stephanie had emphasized her focus on her students several times throughout the semester, yet did not reflect upon pedagogical or interpersonal skills during this time. This anomaly is the opposite of what was previously described. In conclusion, the researcher understood these anomalies to mean that just because a participant reflects on something, or says that they are doing

something, it does not mean that they are actually doing it. Similarly, a participant could do something and not reflect on it, and both of these applied to Stephanie's situation.

In summary, according to passages selected from interview transcripts and participant work samples to illustrate the knowledge, skills, and dispositions that facilitated Stephanie's development of a critically reflective practice during the student teaching semester, several distinctive characteristics were seen: Stephanie's level of reflection focused on the reflection-in and on-action orientation, her higher level reflections focused on the social responsibility factor of teacher capacity, and in general, she reflected most often on the factors of teacher capacity associated with the teacher-social milieu commonplace interaction group. Stephanie did not reflect at all on the constructivism / inquiry, pedagogy, or interpersonal skills factors of teacher capacity.

Table 4.5g: A comparison of the distinctive characteristics of Stephanie's reflective practice in the methods and student teaching semester.

	Methods Semester	Student Teaching Semester
Level of Reflection	Equally distributed	Reflection-in and on-action
High Reflection and Factor of Teacher Capacity	Social Responsibility	Classroom Management
Commonplace Interaction Group Focus	Teacher-Social Milieu	Teacher-Social Milieu
Missing Factor of Teacher Capacity	Content / Subject Area Curriculum / Standards Classroom Management	Constructivism / Inquiry Pedagogy Interpersonal skills

By examining the data from both semesters (Table 4.5g), the researcher was able to locate several important patterns between the two semesters. First, Stephanie's level of reflection had changed from being equally distributed among all levels during the methods semester to the reflection-in and on-action and personalistic orientations during

the student teaching semester. Second, the topic of Stephanie's critical reflections seemed to reflect the environment in which she was situated; an alternative high school placement during the clinical field experience in the methods semester could have resulted in her focus on social responsibility. Additionally, a difficult time with discipline in her student teaching placement contributed to by the school culture and her cooperating teacher's lack of structure, could have resulted in a focus on classroom management. Lastly, the researcher concluded from this review of data that in the student teaching semester, Stephanie did not rely on critical reflection for more than three percent of her reflections. The researcher felt that this was indicative of a deficit in Stephanie's professional progress, both in terms of teacher capacity and development of a critically reflective practice.

Table 4.5h: Stephanie's changing ability to reflect on factors of teacher capacity

	Passages Reviewed that Increased in Complexity and Depth	Passages Reviewed that Decreased in Complexity and Depth	Passages Reviewed that had no Change in Complexity and Depth
Factor of Teacher Capacity	Intrapersonal Skills	Planning	Knowledge of Students / Learner Diversity
	Pedagogical Content Knowledge	Real World Application	
	Pedagogy	Interpersonal Skills	

Qualitative Analysis - Teacher Capacity

As mentioned previously in this chapter, this section complements the quantitative results discussed in the first section by examining the complexity and depth of passages categorized within the framework of teacher capacity. Table 4.5h illustrates the results of this examination by indicating which factors of teacher capacity contained

passages that increased, decreased, or stayed the same. In general, Stephanie's passages, when examined for an increase in complexity and depth from the methods semester to the student teaching semester, showed a transition from theory to practice. Within this generalization, Stephanie's passages evolved from a simple statement, such as her structured journal response. "When looking at the videos of my teaching methods during the demos I presented, I learned so much about myself and found characteristics that I would want to change" (St01), which does not have much depth, to a slightly more complex statement, such as her explanation of journaling in an interview.

Each day when I'm doing my journal I talk about what goes right and what goes wrong and things I've experienced and things I've changed for next time. Sometimes I do it with the cooperating teacher and we talk about things we could do differently or things we saw or different strategies to use (St75).

In this passage, Stephanie introduces outside evidence to discuss the validity of an issue upon which she is reflecting, showing growth in her capacity as an educator. This passage is representative of several within the data collected for this participant. In the following section, section three of this case study, Stephanie's development of a critically reflective practice is discussed.

Qualitative Analysis - Critical Reflection

In this section, the researcher asks the question "Did Stephanie's critically reflective passages increase in complexity and/or depth? By comparing critically reflective passages collected during the methods semester (n=9) with critically reflective passages collected during the student teaching semester (n=2), the researcher concluded that Stephanie did not increase her level of critical reflection. Stephanie demonstrates in

the methods semester that she is able to consider the critical and ethical aspects of her practice, but in the critically reflective passages from the student teaching semester, the complexity actually decreased from that of the methods semester passages.

Case Summary - Stephanie

In reviewing Stephanie's development of factors of teacher capacity and critical reflection throughout the methods and student teaching semesters, several patterns are evident. First, quantitative analysis of passages from interview transcripts and participant work samples indicated that Stephanie's reflections remained focused on the external factors of her practice (social responsibility or classroom management). Second, qualitative analysis of these passages through the teacher capacity framework indicated that Stephanie demonstrated a slight increase in her capacity as an educator, as evidenced by an increase in the complexity and depth of her teacher capacity. Lastly, Stephanie demonstrated a declining level of critical reflection represented by her inability to accurately assess areas of strength and weakness (with assistance from outside evidence).

Summary

Of these three aspects, the analysis of passages selected from interview transcripts and participant work samples focus on the participants' uses of outside evidence to inform their practice. Within this aspect, the researcher identified three knowledge, skills, and dispositional behaviors that indicate critical reflection: accurately assessing one's strengths or weaknesses, using outside evidence to assist one in this process, and incorporating what was learned into their plans for upcoming lessons.

Research Questions

In this section, the researcher uses the results from each of the case studies to answer the research questions posed. The main focus question was: How did critical reflection inform teacher capacity within the secondary science pre-service teacher population? This question was supported by the sub-focus question(s): What knowledge, skills, and dispositions facilitated secondary science pre-service teachers in developing a critically reflective practice? In this chapter, the researcher addressed these questions through the perspectives of: quantifying the number of passages through frameworks of reflection orientation, factors of teacher capacity, and commonplace interaction groups, and qualitatively examined selected passages within each of these frameworks for their complexity and depth of meaning.

How Did Critical Reflection Inform Teacher Capacity Within the Secondary Science Pre-Service Teacher Population?

Table 4.6 illustrates the cumulative quantitative analyses of the three frameworks within the passages from each participant that were analyzed. As evidenced by this data, the researcher concludes that critical reflection informs teacher capacity by encouraging meaningful learning with any factor of teacher capacity. In this study, with most of the participants, the researcher found that within the highest levels of reflection (reflection-in and on-action and critical reflection), the factor of teacher capacity most reflected upon were similar or identical to those factor of teacher capacity that were reflected most frequently upon in general. For example, in the student teaching semester, Fred focused most frequently on his interactions with students (teacher-student commonplace

interaction group), which includes the factors of teacher capacity such as pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management. In addition, his highest level reflections mirrored this trend, as Fred reflected most frequently upon the classroom management factor of teacher capacity.

Table 4.6: Summary of Participant Results

	Factor	Eva	Fred	Michael	Sarah	Stephanie
Methods Semester	Orientation of Reflection Focus	Deliberative	Deliberative	Deliberative	Deliberative	Equally Distributed
	High Reflection and Factor of Teacher Capacity	Planning Classroom Management	Intrapersonal	Intrapersonal	Pedagogical Content Knowledge	Social Responsibility
	Commonplace Interaction Group Focus	Teacher-Self	Teacher-Student	Teacher-Self	Student-Curriculum	Teacher-Social Milieu
Student Teaching Semester	Orientation of Reflection Focus	Deliberative Personalistic	Reflection-in and on-Action Critical Reflection	Personalistic	Deliberative Critical	Reflection-in and on-action
	High Reflection and Factor of Teacher Capacity	Interpersonal	Classroom Management	Intrapersonal	Intrapersonal	Classroom Management
	Commonplace Interaction Group Focus	Teacher-Student	Teacher-Student	Teacher-Self	Teacher-Self Teacher-Student	Teacher-Social Milieu

These results, seen in almost all participants in this study, illustrate to the researcher that frequent reflection upon a specific factor of teacher capacity, or commonplace interaction group, can result in the participant reaching higher levels of reflection. Critical reflection indicates critical thinking, which has value in many areas, including national standards for teacher preparation, discussed earlier in this study.

What Knowledge, Skills, and Dispositions Facilitated
Secondary Science Pre-Service Teachers in Developing a Critically Reflective Practice?

The researcher answers this question using the framework of the remaining four out of five commonplace interaction groups: Teacher-student, teacher-curriculum, teacher-social milieu, and student-curriculum.

Teacher-Student Interactions – Students as Individuals: A secondary science pre-service teacher's ability to relate to students as individuals, rather than a collective class unit, is an indicator of developing professional practice. It indicates a proactive thought process, rather than a formulaic, reactive thought process in which student teachers are trying to implement best practices without considering the perspective of the students themselves, and it is an important dispositional quality for these beginning student teachers to possess. The teacher-student commonplace interaction group consists of four factors of teacher capacity in which this indicator of an increasing capacity can be seen: pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management. This indicator of an increase in teacher capacity is demonstrated by almost all of Eva's passages during the student teaching semester. The following example illustrates Eva's ability to structure her instruction based on the needs of particular students:

I think if I were to redo this lab with these guys I would have assigned them what station I wanted them to be at because this group was all in this back bench where we are right now, those two groups, they distracted each other a lot. Kate and Jack were there and then James's group. James and Kate are dating and if they're ever close to each other like that it's like flirty, like they want to hang out. Now when they are separate they are really good workers, it's just that they distract each other. Plus having all those guys like John and Jack over there in the way, they'd be able to talk

to everybody as they came over there. I want to move that around a little bit. My explanation, I think as far as my demo went just as well as the other classes. I think there's always something little, like I wish I would have said this first or forgot to say that (E60).

At this point, the researcher does not have a clear discernment as to what leads to an increase in viewing one's students as individuals, rather than a collective unit.

Teacher-Curriculum Interactions: Using Prior Knowledge in a New Context:

Theoretical methods and techniques in the undergraduate program help guide the participants' critical thinking and teacher capacity as they relate to teacher-curriculum commonplace interaction group (which includes the teacher capacity factors of content / subject area and curriculum / standards). As student teachers become more confident in their new role, they are able to identify opportunities where this prior knowledge would be useful. In this study, using prior knowledge in a new context is illustrated by the use of meta-cognition, or thinking about one's thinking. Two primary examples are seen in this study: Eva's and Michael's uses of concept mapping to understand the content they are each teaching, and also as a learning tool for students, is an example of meta-cognition, or the thinking about one's thinking, that can be done alone. Fred's use of collaboration in critical reflection, or talking with another person about what he thinks about his thinking is another way to critically reflect upon one's practice that provides context for the person who is reflecting. There are other useful practices they have been taught in their undergraduate program, but these practices were not readily identified within the data that was collected. The researcher predicted that because of the steep learning curve of student teaching, these pre-service teachers became more comfortable and confident in

their new surroundings as time progressed, and that as in-service teachers they may increasingly use these practices later in their educational careers.

Teacher-Social Milieu Interactions - Considering Multiple Perspectives: The ability to consider an increasing number of factors within one's reflections is indicative of an increasing understanding of that factor of teacher capacity. Part of becoming a teacher is being able to have adaptive expertise, and being able to adjust to and be flexible with the context in which one teaches. This indicative quality contributes to the adaptive expertise / context factor of teacher capacity. By increasing the number of factors that one considers in his/her reflections, or is able to work with in the classroom, a pre-service teacher is demonstrating his/her increasing ability to work within the commonplace of the social milieu. Most of the participants in this study increased the number of factors they considered in their reflections, but this quality is best illustrated by Fred, in his ability to consider what he had learned, what he was experiencing, and how these two things fit with his own philosophy as an educator within the context of his relationships with his students. This resulted in the greatest increase of teacher capacity and critical reflection identified within this study.

Student-Curriculum Interactions: This commonplace interaction group, which consisted of pedagogical content knowledge, constructivism and inquiry, and real-world application, was not identified as a contributing factor to an increase in teacher capacity. According to the results, this is the commonplace interaction group least reflected upon by all participants.

Summary

In general, the researcher identified several themes within the first three cases that were examined in this study. In Eva's case, we see themes of multiple perspectives, advance planning, using prior knowledge in a new context, and relating to students as individuals, all of which indicate an increase in teacher capacity. In Fred's case, we see themes of meta-cognition, collaboration, and taking action, which indicate an increase in critically reflective practice. In Michael's case, we again see the use of prior knowledge in a new context. In the last two cases, Sarah's and Stephanie's, the researcher identifies a different focus: one that relates to the analysis of data within this study, and also points to these participants' development of critical reflection and teacher capacity. In Sarah's case, the researcher concluded that although Sarah did not feel as though she was making progress, due to her relationship with her cooperating teacher and her students, she did make progress in the areas of teacher capacity and critical reflection. In Stephanie's case, the researcher concluded that although Stephanie felt as though she was making progress, the data did not support this assumption in the area of critical reflection. In general, most participants in this study focused on deliberative reflection in the methods semester. In addition, most participants neglected to reflect upon the teacher-curriculum commonplace interaction group. Implications of all of these results will be discussed in the following chapter.

CHAPTER 5

CONCLUSIONS

The purpose of this qualitative case study was to describe the development of teacher capacity and how it related to critical reflection for five secondary science pre-service teachers. The overarching research question posed for this study was “How did critical reflection inform teacher capacity within the secondary science pre-service teacher population”? As previously described, reflection is identified by several governing bodies (INTASC, NCATE, NSTA, NRC) as an important part of a teacher’s body of knowledge, skills, and dispositions. The sub-questions that were investigated included (1) What knowledge facilitated secondary science pre-service teachers in developing a critically reflective practice? (2) What skills facilitated secondary science pre-service teachers in developing a critically reflective practice? And (3) What dispositions facilitated secondary science pre-service teachers in developing a critically reflective practice?

By reviewing the results of the data compiled by interviews, participant work samples, and observations, the researcher found that frequent reflection leads to critical reflection, and critical reflection, when practiced in a way that combines meta-cognition, collaboration, and action, encouraged meaningful thinking and learning experiences for the pre-service teachers in this study. In the following sections of this chapter, the researcher discussed the implications of these findings.

Main Focus Research Question: How did Critical Reflection Inform Teacher Capacity within the Secondary Science Pre-Service Teacher Population?

In the beginning of this study, the researcher understood critical reflection to be part of the intrapersonal skills that a teacher must possess. The researcher defined critical reflection as: the viewing of the social and ethical implications of one's practice, the understanding that one is part of the social environment in which they are teaching, and the pre-service teachers' use of evidence provided by sources such as peer feedback, video, and student work to inform one's practice. After conducting this study, reviewing the data that was collected, and identifying several behaviors that are important to the process of critical reflection, the researcher's understanding had evolved. The researcher then understood that critical reflection is not part of the intrapersonal skill set—critical reflection actually *includes* the intrapersonal skill set, and there are knowledge, skills, and dispositions that increase one's ability to conduct critical reflection, such as confidence and understanding, collaboration, introspection, organization, *and* planning, preparation, and knowledge of self.

Within the definition of critical reflection used for this study, the results of this study focuses more on the gathering of outside evidence to inform one's practice than the practice of pre-service teachers inquiring into the social and ethical domains of their teaching, and acknowledging that they are a part of the social milieu in which they teach. There was only one passage found in which the participants mentioned their responsibility as a teacher (F098). Because of this, the researcher concluded that in this study, the remaining two factors were not focused on either because of the participants' choice or the environment of the university where they were enrolled in a teacher

preparation program, or the school climate in which they were assigned to student teach. Based on these results, the researcher felt that it would be necessary to design future research studies that focus on the neglected aspects of critical reflection prior to drawing any major conclusions about the relationship of teacher capacity, critical reflection, and the secondary science pre-service teacher population.

In summary, by establishing a new factor of teacher capacity, the critically reflective practice, the researcher redefines one aspect of the new framework which was developed for this study; the teacher-self commonplace interaction group now consists solely of one factor of teacher capacity; critically reflective practice. For the purposes of this study, this practice encompassed intrapersonal skills and collaboration and planning, among others. In addition, the behaviors that comprised a critically reflective practice are only partially addressed by the results of this study. The development of a critically reflective practice among secondary science pre-service teachers could exponentially impact our understanding of teacher capacity given the opportunity to conduct more research in this area.

In addition to the evolution of the researcher's understanding of the relationship between critical reflection and teacher capacity, other results specific to the context of teacher education were apparent. Results from the cumulative quantitative analyses of the three frameworks within the passages from each participant were analyzed. As evidenced by this data, the researcher concluded that critical reflection informs teacher capacity by encouraging meaningful learning with any factor of teacher capacity. Within the highest levels of reflection (reflection-in and on-action and critical reflection), the factor of

teacher capacity most reflected upon were similar or identical to those factors of teacher capacity that were reflected most frequently upon in general. For example, in the student teaching semester, Fred focused most frequently his interactions with students (teacher-student commonplace interaction group), which includes the factors of teacher capacity such as pedagogy, interpersonal skills, knowledge of students / learner diversity, and classroom management. In addition, his highest level reflections mirrored this trend, as Fred reflected most frequently upon the classroom management factor of teacher capacity. Therefore, the more the participant reflected, the more likely they were to reach higher levels of reflection.

Conversely, some have found that critical reflection increases how a person thinks about a topic, such as factors of teacher capacity (Bain, 1999). Within this interpretation, using critical reflection in tandem with factors of teacher capacity would encourage more meaningful experiences and opportunities for pre-service teachers to develop a critically reflective practice. One use for this critically reflective practice could be a self-assessment measure that allowed pre-service teachers to provide evidence that they were or were not meeting the expected standards, such as those mandated or recommended by national, state, and local standards. The practice of critical reflection also encourages the pre-service teacher to examine how *they* are part of the cause of an issue in their classroom (Bain, 1999). This, in turn, provides a pathway to solving issues regarding one's professional practice. Having a method by which to assess the progression in one's teaching practice could provide empowerment to pre-service and in-service educators. In addition, this aspect of ownership and responsibility for one's own learning has been seen

to be a major characteristic of many master teachers. Within this study, the researcher identified distinguishing characteristics within the process of critical reflection.

Behavioral Pattern of Critical Reflection: Critical reflection (as opposed to the general practice of reflection), involves others in the reflection process. The results of this study indicated that when practicing critical reflection, the participants demonstrated their ability to correctly identify teaching and learning issues within their practice (“meta-cognition”), their ability to use outside evidence such as video, peer feedback (“collaboration”), and their use of student work to learn about these issues, implementing the new information they learned into their practice (“action”). This practice of *meta-cognition*, *collaboration*, and *action* is exemplified by the following passages, extracted from the data collected about Fred:

- Meta-cognition- Well I knew that just from experience that sometimes I learned at a different pace than others, you know, when I was in school, in high school or in college (F040).

Here, Fred illustrated critical reflection based on his personal experience as a student.

- Collaboration - I notice on the video clip now the two boys up front, they’re fooling around a lot. They got to pick their own seats and I told them today that if they continue to fool around and not do their work, then I’ll, I’m going to have to separate them (F060).

In this excerpt, Fred uses video as a way to collaborate with an external perspective to inform his teaching practice. It is important to note that the interactions between the

teacher and the student are multi-layered and multi-faceted, and the collaborative step in this practice can be approached in many ways. First, by using student work, the teacher is able to identify unique aspects of his or her students and their differences in learning. Second, the teacher can survey students, gaining their perspective on the instruction they are receiving. Third, the teacher can ask a peer to observe their class and provide feedback regarding their interactions with their students. Lastly, the teacher can use video to be able to observe important aspects of their practice not readily visible while teaching, such as classroom misbehavior.

- Action - I was thinking that I prefer to use it [a newly learned concept] to start class tomorrow. Because tomorrow I have, tomorrow is a 1, 2, 4, 5 day so I have both biology's the same day so I could do the same thing back to back. And I was going to, I didn't even mention it, I kind of didn't think to really mention it in class today, but I was just going to start, we already talked about it second period so they already know what were talking about but I would just start off class by saying 'hey, just so you know there's scientists in the world trying to discover things today. Has anybody heard about the Hadron proton accelerator'?

In this passage, Fred talks about incorporating new knowledge into his planned lesson, and seems to visualize how he will conduct the lesson, prior to teaching it (Danielowich, 2007).

The practice of meta-cognition, collaboration, and action within critical reflection can facilitate an ongoing cycle in which pre-service teachers continually inform and improve their teaching practice (Figure 5.1). Unfortunately, the majority of the

participants in this study did not exhibit this step (taking action) when practicing critical reflection. This could be a factor of participant age, as some research has concluded that mature aged students may reach higher levels of reflection (Bain, 1999). Fred, who successfully practiced all 3 behaviors did not represent the age group discussed in Bain's study (30 years of age and older), however he did have prior job experience, as teaching was his second career choice.

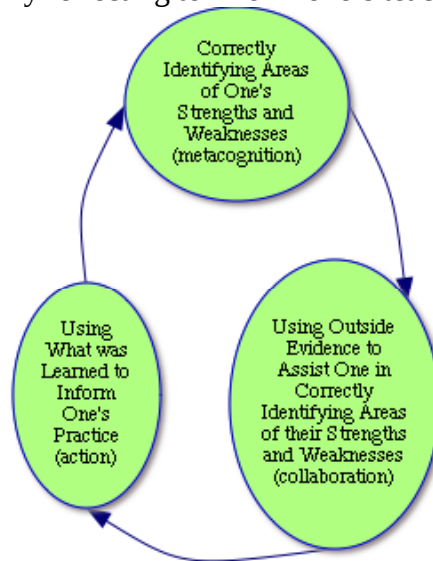
Sub-Focus Research Questions 1, 2, and 3: What Knowledge, Skills, and Dispositions Facilitated Secondary Science Pre-Service Teachers in Developing a Critically Reflective Practice?

The researcher has established that critical reflection (categorized in the teacher-self commonplace interaction group) will provide the opportunity for a pre-service teacher to increase their professional capacity. The knowledge, skills, and dispositions that indicate an increase in teacher capacity identified earlier in this study are: considering multiple perspectives, using prior knowledge in a new context, and acknowledging students as individuals. Each of these characteristics that the researcher identified demonstrated meaningful learning.

Recognizing, or being able to synthesize multiple perspectives is an indicator of organized thought. Reflection through journaling, one of this study's major data sources has been recognized as a way for one to organize their thoughts, set goals, and assess one's practice (Good, 2002, Bain, 1999). Recognizing an increasing number of perspectives during one's student teaching practicum, as was observed in almost all of the participants in this study, represents an increase in their organized thought, and demonstrates that pre-service teachers to more efficiently adapt to the environment in

which they are teaching. When one recognizes that they are part of this environment, and uses outside perspectives to assist them in accurately assessing their work, they are practicing critical reflection. Being able to address multiple perspectives is part of the critical reflection cycle described below.

Figure 5.1: Cycle of critically reflecting to inform one's teaching practice.



Using prior knowledge in a new context also illustrates that meaningful learning has taken place. For these participants to use activities and techniques such as concept mapping and various orientations of reflection, as demonstrated by Eva, Michael, and Sarah, is evidence of this learning. These participants used these techniques not only to address the learning of their students, but also to address their own learning and organization, or issues of uncertainty in their practice. Using prior knowledge is an indicator that meaningful learning, or learning with understanding (Donovan and Bransford, 2005) has occurred in one's professional knowledge, skills, and/or dispositions.

Recognizing students as individuals, rather than a cohesive unit is an important part of growth in one's capacity as an educator. As pre-service teachers become more comfortable in their role as educators, they are able to acknowledge and work with these students as individuals. In addition, this behavior indicates that a teacher is recognizing that they themselves are part of a social environment that also includes the students, the school and the outside community. A particularly poignant illustration of the development of this growth is demonstrated when Fred commented in an interview that he pays attention to the facial expressions of his students.

In general, the researcher identified several themes within some of the cases that were examined in this study. For example, in Eva's case, we observe themes of multiple perspectives, using prior knowledge in a new context, and relating to students as individuals, all of which indicate an increase in teacher capacity. We also see a theme of advanced planning, which has been identified by the researcher as part of the critical reflection cycle. In Fred's case, we observe themes of meta-cognition, collaboration, and taking action, which indicate an increase in critically reflective practice. In Michael's case, we again observe the use of prior knowledge in a new context. In the last two cases, (Sarah and Stephanie), the researcher identifies a different focus. This focus relates to the analysis of data within this study, and also points to all of the participants' development of critical reflection and teacher capacity. In Sarah's case, the researcher concluded that although Sarah did not feel as though she was making progress, due to her relationship with her cooperating teacher and her students, she did make progress in the areas of teacher capacity and critical reflection. In Stephanie's case, the researcher concluded that

although Stephanie felt as though she was making progress, the data did not support this assumption in the area of critical reflection. In general, most participants in this study focused on deliberative reflection in the methods semester. In addition, most participants neglected to reflect upon the teacher-curriculum commonplace interaction group.

The steps identified within the cycle of critically reflective behavior (meta-cognition, collaboration, and taking action), are related to the characteristics that were identified by the researcher as indicating an increase in teacher capacity. Each of these behaviors can be categorized as reactive thinking (responding automatically to stimuli), or critical thinking (thinking through a situation and responding appropriately within the context). Participant behaviors that were previously discussed in this study that illustrate the contrast between reactive thinking and critical thinking are displayed in Table 5.1.

Table 5.1: Examples of participant behaviors in the reactive thinking or critical thinking categories.

Critical Thinking	Reactive Thinking
Seeing students as individuals	Seeing students as a unit
Using prior knowledge	Not using prior knowledge
Multiple, expanding perspectives	Singular perspectives
Using outside evidence to inform one's practice	Not using outside evidence to inform one's practice
Correctly assessing one's strengths and weaknesses	Incorrectly assessing one's strengths and weaknesses
Using what was learned from critical reflection in teaching practice	Not using what was learned from critical reflection in teaching practice

How the Results of This Study Influence the Researcher's Personal Practice

The researcher conducted this study as a graduate teaching assistant and university supervisor. Participating in these roles while conducting this study had a

significant impact on the researcher's own knowledge, skills, and dispositions, and this newly gained information will influence her instruction and delivery of content in future teacher education programs, as the primary instructor.

First, the researcher learned that in teaching and supervising secondary science pre-service teachers, it is necessary to encourage this population to focus on their teaching issues. Creating case records, as suggested by Osterman and Kottkamp (1993) would be a useful way to achieve this goal, as this process directly asks students to proceed through a cycle, similar to that identified by the researcher in this study. By specifically requiring secondary science pre-service teachers to go through the process of identifying a problem, establishing outcomes and objectives, considering alternatives, implementing strategies, stating their results, and assessing this process, the researcher felt that students would be more likely to correctly identify areas of strength and weakness, and also to use outside evidence to assist them in this identification.

Next, the researcher concluded that in future classes; she would encourage these students to examine their part in the social and ethical issues that occur in their classroom. By implementing a lesson about Schwab's *Commonplaces of Educating* (1973) into the curriculum, and discussing the manner in which these commonplaces interact, the pre-service teachers would increase their awareness of the social and ethical issues that exist within their classroom, their school, and their own practice.

Next, the researcher concluded that in future classes, she would spend a significant amount of time not just focusing on teaching collaboration and meta-cognition, as was done in the methods class that was observed, but she would also

increase the opportunities for pre-service teachers to fully understand these methods, possibly by requiring students to journal about how using collaboration and meta-cognition allowed them to inform their practice.

Lastly, as a general indicator of the process of development of factors of teacher capacity and reflective practice, the researcher concluded that she should closely examine the focus of pre-service teachers' reflections, and classify each reflection into a commonplace interaction group. Implementing this practice would allow the researcher, or teacher educator, to better understand the pre-service teachers' understanding of teaching, and how their practice reflects that understanding.

In conclusion, the researcher identified four areas in which the results of this study would improve her own, and others' professional practice. By requiring students to create case records and examine the social and ethical implications of their practice, increasing opportunities for pre-service teachers to reflect on activities of collaboration and meta-cognition, and by looking closely at the commonplace interaction group focus of pre-service teachers' reflections to better understand their comprehension of teaching theory and practice, the researcher hopes to use the knowledge, skills, and dispositions gained throughout this study to inform her practice as a teacher educator.

Future Research

After considering the results of this study, the researcher plans to create two additional studies that would better inform her practice as a teacher educator. The first study will again focus on the population of secondary science pre-service teachers, and it

will attempt bridge the gap discussed in the previous chapter regarding this population's understanding of the social and ethical implications of their practice. The second study that the researcher plans to conduct is similar study to the one discussed in this paper, however the participants would be drawn from the population elementary education pre-service teachers studying science education.

Conducting this study with the population of elementary education pre-service teachers would provide new and different insight for the researcher. The researcher's expectations for this population are quite different from those for pre-service secondary educators. First, the elementary pre-service teacher population that will be studied does not solely focus on one subject. Elementary educators are expected to be able to teach science, math, history or social studies, as well as language arts. They could be described (in comparison with the secondary educator population) as generalists, because they are required to consider many variables within their pedagogical approach, and they may not consider the cycle proposed in this study (which is scientifically based) as relevant to their practice. However, they may see using this cycle, or following the steps of Osterman and Kottkamp's (1993) case record model as relevant to all areas that they teach. Lastly, the researcher is curious as to whether or not the social and ethical implications of one's practice that the elementary pre-service teacher population identifies are similar to those identified by the secondary pre-service teacher population.

By combining the results of this proposed study with the results of this study, the researcher would be able to gain a more complete and comprehensive view of how a

critically reflective practice is developed among the secondary science pre-service teacher population.

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APPENDICES

APPENDIX A

COURSE DESCRIPTION FOR REQUIRED CLASSES

COURSE DESCRIPTIONS FOR REQUIRED CLASSES

EDSD 466 METHODS OF TEACHING SECONDARY SCIENCE □F,S 3 cr. LEC 2 LAB 1 □PREREQUISITE: EDCI 360, 20 or more credits in subject area, and admission to the Teacher Education Program. □COREQUISITE: EDSD 301 (for teaching majors in this subject). □COREQUISITE: For science majors: EDSD 400. □-- Focuses on methods of planning (including lesson/unit), teaching, and evaluating science inquiry skills, content, attitudes, and safety in the secondary classroom.

EDSD 301 PARAPROFESSIONAL EXPERIENCE □F, S 1 - 3 cr. LEC □PREREQUISITE: EDCI 360 and good standing in Teacher Education program. □COREQUISITE: Methods course in teaching major. □-- Students will be assigned to school classrooms to observe children, teachers, and teaching strategies, and to serve as teacher aids. Students will co-teach and teach lessons in the subject area corresponding to their major-area methods class in which they are currently enrolled (60 contact hours required). Students will also meet on campus in their discussion section once a week to reflect and to analyze on their field experiences.

EDSD 410 STUDENT TEACHING □F,S,Su 5 - 12 cr. IND □PREREQUISITE: Senior standing, completion of all required EDSD special methods courses, and good standing in Teacher Education Program. □COREQUISITE: EDSD 413. □-- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student teaching experience will occur under the supervision of experienced teachers and MSU staff supervisors. Observational participation at grades five and/or six also takes place.

APPENDIX B

DEPARTMENT OF EDUCATION PROGRAM BASICS

DEPARTMENT OF EDUCATION PROGRAM BASICS

The program basics required by the Department of Education include:

- communication
- intellectual (conceptual, integrative, and quantitative) abilities for problem solving and effective teaching
- professional, behavioral, and social aspects of the performance of the teacher.

Communication competencies are demonstrated by such behaviors as using the appropriate grammar (syntax, inflection, and word choice) in oral communication, speaking distinctly and with confidence; and using correct spelling, standard English language mechanics, and meaningful word choice in written expression. Further, communication with students and families is demonstrated by sensitivity to the situation and family circumstances of the students.

The student must have the **cognitive abilities** necessary to master relevant content in subjects commonly taught in K-12 schools and pedagogical principles and their application in field settings at a level deemed appropriate by the faculty. These skills may be described as the ability to comprehend, memorize, analyze and synthesize material. Students must be able to develop reasoning and decision-making skills appropriate to the practice of teaching.

Additionally, the student must be able to demonstrate the following **knowledge, skills and abilities**:

1. Understand the ethical and moral complexities of schooling and have developed a values position in relation to ethical and moral issues.
2. Understand the social/political dimensions of schooling.
3. Understand the central concepts, tools of inquiry, and structures of the disciplines and create learning experiences that make these aspects of subjects or content knowledge meaningful for students. This includes identifying appropriate learning resources and writing lesson/unit plans.
4. Understand how children learn and develop and provide learning opportunities that support their intellectual, social, and personal development. This includes working effectively in groups as well as individually.
5. Understand how students differ in their approaches to learning and create instructional opportunities which are adapted to diverse learners.
6. Understand and use a variety of instructional strategies to encourage students' development of conceptual understanding of various areas through critical thinking, problem solving, and performance skills.
7. Apply knowledge about individual and group motivation and behavior to create learning environments.
8. Use knowledge of effective verbal and nonverbal communication techniques and make appropriate use of educational technology to foster active inquiry, collaboration, and supportive interaction in the classroom.
9. Plan instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

APPENDIX B CONTINUED

10. Understand and use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner. This includes spontaneous editing of student work individually and/or in groups or whole class settings.

Appendix B continued

11. Foster relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well being.
12. Continually reflect on and evaluate the effects of his/her choices and actions on others (students, parents, and other professionals) and actively seek opportunities to grow professionally. This includes punctuality and attendance issues.
13. Meet the physical demands of the teaching job, which involve supervision of the classroom and possibly various other school areas such as laboratories, playgrounds and hallways.

Professional responsibilities are demonstrated by behaviors such as:

- fully participating in class and field settings
- completing assignments and meeting responsibilities on time
- seeking assistance from instructors and supervisors when appropriate
- prioritizing responsibilities
- demonstrating openness to new ideas
- being willing to accept constructive criticism and using that criticism to improve performance
- taking initiative
- using good judgment
- demonstrating poise and flexibility
- displaying a positive and enthusiastic attitude

Behavioral and social attributes are demonstrated by behaviors such as:

- developing positive relationships with members of the cohort and education professionals
- treating individuals with respect
- using tact and discretion
- setting a positive and respectful tone in interactions with others
- actively listening to other viewpoints
- recognizing one's own strengths and weaknesses and responding appropriately
- perceiving a wide range of interpersonal cues from others and responding appropriately
- working effectively in groups

Additional attributes necessary for the teaching profession include:

- compassion
- justice
- empathy
- integrity
- responsibility
- the physical and emotional capacity to handle the varying demands of the job

APPENDIX C

COURSE SYLLABUS FOR EDSD 466

COURSE SYLLABUS FOR EDSD466

**Content of EDSD 466
Secondary Science Teaching**

The course is made up of sections, each of which requires a variable amount of time. Some parts of these are independent in nature, others are more structured and formal. Several major themes such as constructivism, learning theory, science process skills, structure of scientific disciplines, assessment, lab safety and computer applications will be presented throughout the course. These will help form linkages between the various units and assignments. As an advanced learner you will be given a great deal of independence in your learning about science teaching.

If there was one thing to make very clear it would be that in this class we are going to try and help you learn the importance of moving from a dogmatic, teacher centered, information transfer approach to teaching science to a student centered approach emphasizing the role of the student in constructing knowledge and negotiating new science meaning with other learners and the teacher. This approach is based on the inherent **inquiry processes** upon which all science is built. This is the logical outgrowth of our college's emphasis on constructivism as the foundation of teaching and learning. This is a formidable task since most of our science background is based in old behaviorist paradigms and we have only one course in your entire career to affect the desired change. We will try to help you understand the importance of this transition. Please be open to new ways of thinking and critical of your science education training. We hope to help you become an effective teacher for what most educators believe is an exciting but different future career in education.

Second, we will emphasize **reflective teaching** as a way for you to constantly improve your education practices through out your career. The class is designed for you to learn skills and grow into a perspective which empowers you to make intelligent decisions about teaching and learning. This approach should inevitably lead to self-reliance and confidence in your ability to continually improve as a teacher. Along with it comes the anxiety of having to make decisions on your own, accepting the fact that nobody is perfect and be able to give and take constructive criticism will help you become a better teacher.

APPENDIX C CONTINUED

Major Assignments

Unit 1. An Overview of Science Education, Professional Literature and Giving a Lecture

This section is designed as a starter in the course, during it you will be introduced to educational techniques such as concept mapping and writing in the subject area. Specific objectives and requirements will be provided through handouts and discussion. An introductory library assignment will be completed. Students will give a lecture/demo in class and construct a concept map in their subject area.

Unit 2. Inquiry-Based Learning & The Science Learning Laboratory

In this section we will review scientific inquiry, laboratory procedures and science process skills. Practical laboratory safety skills will be emphasized. A laboratory file, Vee analysis, materials inventory and safety check will be made. In addition, you will participate as a member of a small group and conduct a mini laboratory for the class.

Unit 3. Organization and Design of Curriculum for Science Instruction

This section will include the design of lesson unit plans for middle level and high school science teaching. The instructional format is primarily independent study. Please be advised that this is very time consuming and must be started early in the course. Several class periods will be provided to assist in the completion of curriculum units. New approaches to science teaching are encouraged.

Unit 4. Microteaching

You will microteach a self-contained lesson exhibiting specific teaching skills. These may include: visual aids, handouts, questioning, demonstrations or computer applications. **Self evaluation and peer evaluation of your microteaching are an important part of this unit.**

Selected Learning Outcomes

1. develop inquiry strategies as learners and teachers of science,
2. understand science in the context of secondary curriculum; scope, sequence, content and terminology,
3. understand how science integrates with other disciplines,
4. examine, compare and critique textbooks, curriculum, resource materials and trade books for use in the classroom,
5. learn science content particularly as it relates to content integration,
6. become aware of personal knowledge, skills and attitudes in relation to science teaching,
7. understand the nature of science and especially science process skills,
8. learn and practice laboratory safety skills,
9. appreciate how social and cultural influences (including gender) affect our understanding of science
10. learn new skills such as performance assessment, concept mapping, Vee diagram and cooperative learning strategies and
11. be actively involved in the transition from student learning to teacher thinking and acting.

APPENDIX C CONTINUED

Throughout the course the following topics will be developed:

Teaching Strategies

Within the science classroom, or any classroom, there is the opportunity to use a number of different teaching strategies. Most strategies chosen by teachers are based on their preferred teaching/learning styles. The emphasis throughout the course is to make the student more familiar with some of the teaching options available in the science classroom.

Field Experiences

The purpose of the field component is to enhance your methods course. It allows you to work with a middle or high school teacher in your content area while studying methods of science instruction. It is the real life experience that is essential for your learning. The para-experience is designed to help you transition to student teaching.

Grading Policy

Your work will be evaluated using point values:

1)	Content & Overview (I)	10
2)	Inquiry & Laboratory (II)	20
3)	Organization of Curriculum (III)	30
4)	Microteaching (IV)	10
5)	self evaluation of performance	5

7) Twenty five points are assigned by instructor for class attendance and class participation including being on time for class, cooperation and positive contributions to classroom activities.

If you choose to turn in late assignments, point value will be lost unless there are prior excused extenuating circumstances.

APPENDIX C CONTINUED**Major Themes of EDSD 466**

Constructivism, the active construction of knowledge by the learner, guides the process of science teaching and learning.

Science Knowledge is constructed by people based on the accepted science **content** (concepts, principles, theories and philosophies of various science disciplines) and science **process** skills (questioning, observation, data collection, etc.) within the specific scientific domain.

Science Learning depends on the existing knowledge of the student (which is influenced by gender, culture, society, etc.), individual learning style and developmental level.

Accepted **Science Standards**, from national to local, guide curriculum, teaching, learning and assessment.

Science Teaching should be based on constructivist principles including: the active engagement of the learner, interdisciplinary approaches, positive attitudes of mind and relevance to the learner. This includes emphasis on **Laboratory Safety**.

Science **Teaching Strategies** should actively engage the learner in the construction of new knowledge that is based on the integration of new knowledge with existing knowledge and relevant application in the real world. These strategies include both individual and group work and student centered approaches with the teacher acting as a facilitator.

Effective science teaching is based on **Intelligent Planning**. This includes annual, semester, unit and daily planning.

Assessment is a routine part of every lesson and is integral to teacher and student learning. This includes both traditional and alternative assessment approaches.

APPENDIX D

EXAMPLE OF PARTICIPANT'S REFLECTIVE SUMMARY

EXAMPLE OF PARTICIPANT'S REFLECTIVE SUMMARY

Reflection on observed lesson:

This experience proved to be a positive and rewarding shift in my progression as a new educator. I was not only very comfortable and confident throughout my presentation but used many of the tools that I have been exposed to in methods class to engage the students. I feel that this experience helped me realize that I can and will be a constructive role model in the classroom. I was content with my ability to integrate an assortment of educational tools, such as a demonstration, PowerPoint notes and inquiry based questioning with discussion throughout the lesson. Some improvements that could have been made were paying closer attention to students' actions, for example popping of gum, drumming tabletops and clicking of pens. Although, these things might not distract me from my presentation, it may be distracting to their classmates and make it hard for them to focus. After the lesson it was apparent through assessment that the students grasped and understood the concepts, which gave me a feeling of accomplishment. Overall, I am very pleased with how my lesson was executed and the level of understanding that was reached by my students.

Comparison between the two lessons:

I was very surprised at the drastic difference between the two lessons that I taught over air pressure. The first period general science class was very interactive and seemed very interested in the examples that were discussed. While the third period class had a very hard time focusing on the topic with the exception of a few students. During the third period class the demonstration seemed to grab their attention and guided them towards thinking about the topic but once the lecture began they quickly lost focus. It wasn't until my first example that the students were able to get back on track. Once a discussion was initiated about the topic the students were easier to engage. By the time I reached some of the more advanced examples in my presentation, most of the class was involved in the discussion. I found that knowing the students names was very beneficial when trying to get them focused and getting them involved in the discussion. Overall, it seemed as though my first period class stayed focused throughout the presentation and didn't take as much prompting as my third period class. I also found that I moved through the material faster during third period and so was left with enough time to run through the demonstration again, in order to have a visual aid for the assessment discussion. Unlike the assessment during first period which we discussed what happened rather than seeing the demonstration again.

APPENDIX E

EXAMPLE OF PARTICIPANT SELF EVALUATION

EXAMPLE OF PARTICIPANT SELF EVALUATION

Final Reflection

What are the most important things you've learned in this class?

What suggestions can you make for how the class can be improved?

How many classes have you missed?

Of these missed classes, how many did you discuss with the professor?

Please indicate the grade you think you have earned

APPENDIX F

EXAMPLE OF PARTICIPANT'S STRUCTURED JOURNAL RESPONSE

EXAMPLE OF PARTICIPANT'S STRUCTURED JOURNAL RESPONSE

Secondary Paraprofessional Observation Assignments

Journal Entries (via email to your university supervisor)

1. What specific behaviors does the teacher use to motivate the students?

Motivation could include: use of visual aids, personal stories, relating the lesson to the students' lives and interests, authoritative (use of grades or future plans, e.g. college), personal teacher enthusiasm for the content, disciplinary, tied the lesson to previous knowledge, teacher feedback, body language, eye contact, teacher movement, teacher listening skills, etc.

List specific teacher behaviors:

Which techniques do you think would best fit your own teaching styles?

2. How does the teacher manage "time" in the classroom?

Record the beginning and ending times for the various "elements" of the lesson; introduction of the lesson, giving directions, giving a lecture, answering questions, allowing students work time, etc. If you have the opportunity, show the teacher your time chart and ask him or her to comment on whether or not they anticipated those times before the lesson began.

How would you have done it differently?

3. What specific behaviors does the teacher do to get the students to begin a new task?

This could be at the beginning of the class or whenever the lesson moves into another task/assignment or topic.

List specific teacher behaviors: eye contact, statements, body language, movement or position in the room, tone of voice, volume of voice, "wait" time, speed of talk, repetition, gestures, use of "talk to the class" or "talk to a specific student", etc.

APPENDIX F CONTINUED

4. How does the teacher give directions?

Teachers give directions for a variety of reasons: to have students focus on a book or specific page, to have students move within the classroom, to get papers collected in an orderly manner, to establish rules for a procedure, to inform students how to go into groups, leave groups, make up group team leaders, etc.

List specific teacher behaviors that were used in this lesson. For example, did the teacher repeat the directions? Did the teacher ask a student to repeat the directions? Did the teacher give a time limit? Did the students appear to understand? Was there an opportunity for the students to ask questions? Etc.

5. How does the teacher handle any discipline problems or disruptions to the lesson?

A discipline problem can be a situation when a student is doing something that is not normally permitted in the classroom. It could also be any student initiated disruption to a planned lesson.

List specific examples of teacher behaviors in response to a student disruption. These could include: ignoring the problem, eye contact, proximity, verbal warning, calling on the student, asking the student to move to another seat, asking to see the student later, giving a detention, making a “note” while looking at the student, etc.

6. How does the teacher deal with students who have specific needs?

A teacher often provides different instruction to certain students, depending on their specific needs. This could include students with a disability (physical, emotional, learning), a student who has missed school and is now behind in his or her work, a new student, a student with English as a second language, a student with a cultural difference, etc.

List specific actions the teacher used to accommodate any specific student needs. You may want to ask the teacher after the lesson to see what he or she used since it is not always that noticeable.

APPENDIX F CONTINUED

7. What type of questioning levels does the teacher use in the lesson?

Script the teacher's questions (this means writing them as fast as you can). Then, review the questions and try to determine what level of Bloom's Taxonomy each question is rated.

For a second lesson observation, try to record both the questions and answers. Rate the answers according to Bloom's Taxonomy. Is the teacher using higher or lower levels of questioning? Are the students giving higher or lower levels of answers?

8. How does the teacher assess whether or not the students are learning the material (meeting the objectives/goals of the lesson)?

Ask the teacher to provide you with his or her expectations for what the students should be learning

At what level will they learn it (recall, application, synthesis, etc.)?

Is it "knowledge", a "skill", a "disposition" that the teacher is addressing?

What format does the assessment take? (Quiz, verbal responses, use in/during a performance or project, a tone of voice during discussion, interactions with other students, percentage of success, etc.

This type of information is interesting to compare with other teachers/paraprofessionals since it represents a very diverse field.

APPENDIX G

EXAMPLE OF PARTICIPANT'S FREE WRITING JOURNAL ENTRY

EXAMPLE OF PARTICIPANT'S FREE WRITING JOURNAL ENTRY

Week 2 Journal:

This week went by really fast, but a lot happened during the week. In biology we started a new unit on Ecology. We started this unit by explaining the differences in population, habitats, niches, and communities. We also described the different interactions of species including parasitism, competition, mutualism, and commensalism. I really liked the activity where we had the students create their own creature. They were assigned to describe this species habitat, niche, and 2 different interactions it has with other species. Other activities we did were discovering the different biomes, finding carrying capacity of deer, and watching a movie on the Sonoran Desert. This movie was a great lesson because it showed a habitat with many different species' interactions, different types of adaptations, and different r-adapted and k-adapted species. I think it helped students understand what ecology was and how it relates to their everyday lives.

In Zoology we did a Bess Beetle lab where the students tested how much weight the beetles could pull. They then had to calculate the beetle's power and compare it to their own. It showed how strong the beetles actually were. We also gave a power point on social organization of bees, termites, and ants.

In P.S. we reviewed more of the scientific method. We ended the week with a quiz and had students rewrite their conclusions. We did a lot of work on graphing and explained the difference of fact, theory, and law.

Overall the lessons were very interesting, but what was even more interesting was what I learned from my students. I learned that some students are very bright when it comes to certain aspects like calculating and comprehending knowledge, but can struggle when writing lab reports both in spelling and literacy. I also found that although students appear to understand the content you are teaching, there are some who are struggling but won't ask you questions.

Other important aspects of teaching that I saw this week is the importance of communication between other teachers in your department. I saw different opinions, ideas, and styles between the departments arise during the PLC meeting that will help me in my own teaching. I will know what to expect

APPENDIX H

EXAMPLE OF METHODS SEMESTER INTERVIEW PROTOCOL

EXAMPLE OF METHODS SEMESTER INTERVIEW PROTOCOL

Interview questions – protocol for first interview, conducted after Unit 1 activity, presentation of a Lecture/Demo to the class.

1. Looking at concept map you drew for Unit 1.

How did this concept map change your thinking about the content?

How did this concept map change your thinking about teaching?

How did this concept map change your thinking about planning a lesson?

What? When? How? Why did this/these change(s) occur?

2. Looking at the video (approx. 1 min.) of your lecture / demo.

How did viewing the video of your lecture/demo change your thinking about the content?

How did viewing the video of your lecture/demo change your thinking about teaching?

How did viewing the video of your lecture/demo change your thinking about planning a curriculum?

What? When? How? Why did this/these change(s) occur?

3. Looking at the feedback cards you received from your peers for the lecture/demo.

How did reviewing the feedback cards for your lecture/demo change your thinking about the content?

How did reviewing the feedback cards for your lecture/demo change your thinking about teaching?

How did reviewing the feedback cards for your lecture/demo change your thinking about planning a curriculum?

What? When? How? Why did this/these change(s) occur?

APPENDIX I

EXAMPLE OF STUDENT TEACHING SEMESTER INTERVIEW PROTOCOL

EXAMPLE OF STUDENT TEACHING SEMESTER INTERVIEW PROTOCOL

Interview protocol 1: to be conducted in the beginning of their student teaching practicum, over the phone.

1. Describe your supervisor.
2. Do you journal?
3. Do you write lesson plans?
4. What is your organization system like, for the material you are collecting?
5. When I visit you, can I look at your journal and lesson plans?
6. Describe your school.
7. Describe your cooperating teacher(s).
8. Describe the classes
9. How long are the classes?
10. Are you comfortable with the amount of time you spend preparing?
11. Are you comfortable with the subject matter?
12. How has your knowledge about teaching changed since you have been in the classroom?
13. How have your skills in teaching changed since you have been in the classroom?
14. How have your beliefs about teaching changed since you have been in the classroom?
15. How do you reflect on your teaching?

APPENDIX J

PASSAGES SELECTED FROM INTERVIEW TRANSCRIPTS AND PARTICIPANT
WORK SAMPLES FOR CODING

PASSAGES SELECTED FROM INTERVIEW TRANSCRIPTS AND PARTICIPANT
WORK SAMPLES FOR CODING

#	Passage	Code
E01	I always feel like I need to know absolutely everything about my topic.	I-Sept07-MS-AE/C-T
E02	Giving presentations in front of my peers has always been difficult for me, but I've usually been more comfortable with kids.	RS-Sept07-MS-AE/C-P
E03	The comments from the class were mostly positive so that really helped my confidence when it was all over, and all the suggestions were very positive and helpful.	RS-Sept07-MS-AE/C-P
E04	I was very nervous especially since someone had done an awesome density demo before me.	RS-Sept07-MS-CM-RIOA
E05	When it came to my closing question about the difference between the rock, ping pong ball, and ice I had pictured it going much smoother but I think I panicked a bit when I did not ask the question right and that's when the intense nervousness hit.	RS-Sept07-MS-IaS-D
E06	I should have tested each object after the students guessed what would happen and maybe even have a table with a prediction and observation column that I or a student could fill in as we went on.	RS-Sept07-MS-IaS-RIOA
E07	Most of my questions I had planned got answered or asked before I had a chance to say anything.	RS-Sept07-MS-KS/LD-RIOA
E08	I was surprised to hear on the comment cards that I looked welcoming and comfortable.	RS-Sept07-MS-PCK-D
E09	I should have had a list of the questions in front of me though, because I know I missed some.	RS-Sept07-MS-PCK-D
E10	I knew that my closure was weak, and the video showed me that I think I was rushing a bit and just wanted to be done.	RS-Sept07-MS-PI-C
E11	I really appreciated the comments about having a good demeanor, attitude, and being approachable, they helped to boost my confidence a lot.	RS-Sept07-MS-PI-D
E12	Things can always go wrong so you've got to be ready to change it.	I-Oct07-MS-IaS-D
E13	I think, as a teacher you have to change and grow and that's what this methods class was all about, was to help us become a better teacher and learn what we need to do and what kind of teacher we are. So I think even in the next twenty years of teaching I'll probably still change how this being a significant moment is part of being a teacher, I think.	I-Oct07-MS-IaS-P
E14	[Having a way to organize the content is important because] so I know I can cover it all in a sequential manner, instead of jumping around. Oh I forgot this, so let's go back and cover this. So it's easier for me to keep, makes me feel more prepared, more comfortable.	I-Oct07-MS-KS/LD-D
E15	So I tried to put myself in Kate's shoes where there's all this stuff that I wanted to say but couldn't say it.	I-Oct07-MS-Pd-C
E16	As teachers we need to learn to handle situations that don't go as planned, cause most of the time lessons won't go as you intend them to.	RS-Oct07-MS-AE/C-D
E17	Also, it probably would have been better to break the groups down further so that there was not so much down time.	RS-Oct07-MS-C/I-D
E18	I'm not sure if I would trust that to a freshman or lower class, but our methods class definitely could have handled it.	RS-Oct07-MS-C/I-D
E19	While planning the lab, we probably should have better planned out specific questions and who was going to ask the specific questions at each table.	RS-Oct07-MS-CM-RIOA
E20	We also found that things are not going to go as planned and that the teacher should be prepared to go where they had not planned on going with the topic and be able to transition into it as if nothing has changed.	RS-Oct07-MS-IaS-D
E21	The graphs would have been a good idea to get the class involved as well, but that never crossed my mind until after I had presented them.	RS-Oct07-MS-PI-RIOA
E22	I gained actual experience with learning by inquiry, I had understood it before but did not know how to incorporate it comfortably until my Para.	SJR-Sept-Nov07-MS-AE/C-P
E23	I would like to get more into the inquiry questioning to lead into new topics, but I think I will need more experience/practice to get really good at it and comfortable doing it.	SJR-Sept-Nov07-MS-AE/C-P

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E24	I've learned quite a bit from this teacher using inquiry, at first it drove me crazy when she would be questioning the students trying to get them to give the right answer when it was so simple, I think I would have just given in and told them the answer. I've learned to be more patient and realized the importance of inquiry.	SJR-Sept-Nov07-MS-AE/C-P
E25	All through my 22 years my friends, especially my mother, have been hinting towards me becoming a teacher and how natural it would be. Nevertheless, I would just take it as a compliment and think nothing more of it. I suppose I had to experience new fields before I could settle on what I knew in the back of my mind I wanted to do all along.	SJR-Sept-Nov07-MS-AE/C-P
E26	I don't think it is possible to cover absolutely everything and have every single student understand.	SJR-Sept-Nov07-MS-AE/C-T
E27	I feel like this question [structured journal question] is very similar to the previous one, beginning a new task and motivating students go hand in hand a lot of times, so that's why I am putting them together in one email.	SJR-Sept-Nov07-MS-C/I-C
E28	I also need to work on my time management skills. I seem to plan too many things to fit into one class period.	SJR-Sept-Nov07-MS-CM-D
E29	I also learned some new discipline tricks from watching my teacher, such as counting down from 3, turning the lights off, and calling on those who are acting up.	SJR-Sept-Nov07-MS-IaS-T
E30	I think my teacher did a very good job with the discipline in her classroom. She didn't ever get angry or yell at the students, but they still listened and respected her. This was very appealing to me, because I am not very good at getting angry or yelling but I don't want the students to walk all over me.	SJR-Sept-Nov07-MS-IaS-T
E31	She was very good at maintaining the classes' discipline without disrupting the student giving the presentation.	SJR-Sept-Nov07-MS-IaS-T
E32	So she makes sure that the lesson is wrapped up in time to give the students the time they need to pack up and so things won't be rushed.	SJR-Sept-Nov07-MS-IaS-T
E33	I like the idea of talking to the student outside of the classroom, that way you get their full attention and they are not as embarrassed as they would be if they were in front of the class.	SJR-Sept-Nov07-MS-InS-D
E34	I would like to become more authoritative, meaning I can handle the discipline of my class better, but still keep my easy-going attitude.	SJR-Sept-Nov07-MS-KS/LD-D
E35	But I think this variety of assessment is necessary and allows most students to express what they have learned.	SJR-Sept-Nov07-MS-Pd-C
E36	As far as my teaching style goes I think I'm really going to enjoy doing demonstrations, they will be fun and interesting for both the students and myself.	SJR-Sept-Nov07-MS-Pd-D
E37	It's a lot easier for me to prepare for lessons because I know the method I need to go and what I need to do and how to practice, more so especially.	I-Dec07-MS-PCK-P
E38	But I knew what I wanted to say and like what I wanted to get them to think about, but I didn't know the right questions to get them there without being too obvious about it.	I-Dec07-MS-PCK-RIOA
E39	Looking back I should have discussed the homework question in class instead of assigning it, it would have added more time and given some closure to my lesson.	RS-Dec07-MS-C/I-D
E40	I should have practiced the end more, perhaps written it all out so the closing would be clearer and really drive the point home.	RS-Dec07-MS-C/I-D
E41	Even though my microteaching did not go as planned, teaching never does, and it was a good learning experience. Like always, it could have gone better, but I am still satisfied with how I did.	RS-Dec07-MS-C/SA-RIOA
E42	One big thing I noticed was that my list of objects and predictions could have been much better organized.	RS-Dec07-MS-CM-RIOA
E43	First off I would like to say I really enjoyed the comments I got from class, both the positive and improvement suggestions.	RS-Dec07-MS-IaS-D
E44	I was excited to have my other high score [on the peer evaluations of lesson] be that I was well prepared, because I've started to realize that I never feel prepared enough no matter how much time I put in.	RS-Dec07-MS-PCK-D
E45	Therefore my lesson lacked problem solving and some inquiry as a few said in their comments.	RS-Dec07-MS-PI-D
E46	I personally had planned it to be much more inquiry and it came out being teacher centered.	RS-Dec07-MS-PI-RIOA

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E47	They've never had a student teacher before so they just want to make sure that I'm getting everything I need out of the experience. They're just like really trying to get me in there, do as much as I can and get as much experience as I can, which is good. And their philosophy is that when they student taught and their first year of teaching there was so much stuff that they didn't know and they want to make sure that I know that stuff, so that's cool.	I-Feb08-STs-AE/C-D
E48	[Journaling] It's kind of like my private reflections, like a lot of things that I might now say Valerie or Rachel or that I might keep inside and I approach journaling a lot of times like, or this is an assignment, not as something helpful for me. But then as I start it I'll be like, on my gosh, and my feelings and my thoughts will just kind of come out, sort of like inadvertently do that, I guess. So it's good that I do it, although I don't like doing it all the time, but it's good.	I-Feb08-STs-IaS-P
E49	As far as not the book tests, I don't use the book tests at all, I make my own. Sometimes I'll take questions from there that I like and I always try to include some question about the lab that we've done. And I like to have a variety, as far as like multiple choice, don't do true-false, hate true-false, essay short answer. I like to have lots of pictures that they label, too. And several kids I send to the resource room to take their test. I talked to them about it, they wanted to, and like their grades have improved, those ladies in there are good with them and they are much more confident about it. Otherwise, I guess other alternative assessments, I'm not sure, but there's lab tests I guess we could be doing, but my sixth graders in the Para, we don't do much like that. So basically I make my own tests.	I-Mar08-STs-RWA-C
E50	[Next time] I would reword these questions a little bit, and maybe, we went over our notes, we talked about viscosity a lot so I thought this would be good for them and they would have that base understanding to be able to expand on it enough. But if I did this again, I would talk more about viscosity, and discuss it with them in class and give all these 'what-if' scenarios so that when they did guess, they'd be like okay, kind of thought about this already, so and then they can kind of expand it on their own.	I-Mar08-STs-IaS-C
E51	Yeah, they answered more like how I wanted them to, like I didn't word the question well enough to get them to answer what I wanted, but these guys got to that point, like they took it to the next step on their own without me having to be like, explain this, and this and this and this. I just said why do you think so. So I really like that. I think turning a page he didn't even answer it, and a lot of this stuff, he filled this in but he didn't, he needed these numbers, I think he just copied, and so that was my bad work example.	I-Mar08-STs-IaS-C
E52	[The parts of the lesson plan for this lab are] I have an introduction, objectives, which I didn't go over a whole lot with the kids. Materials, that's more so there for me to refer to. Pre-lab questions because I wanted them to think about it, cause this wasn't good enough for them to understand. So this help them a little bit. Procedure, try to keep it very simple because some of these guys just it takes a while to like get it in their head what they're doing, so the simpler the better I feel. Even I am intimidated by lots of directions. Then my table I made and then this; I think I might change this next time I do it. I'm not sure I like this, I probably would the numbers on the side for them. I thought that would be another step for them as far as graphing to learn, but I think it just confused them, such a broad range of numbers that it was hard. Then my post-lab questions, I tried to get more higher level thinking, but I probably could have had some more questions on there. Then this is my key that I scribbled notes on.	I-Mar08-STs-PCK-D
E53	I think other classes will talk a little bit when they're not supposed to be, but they will still know what's going on. They kind of listen, they can multi-task. These guys, if they don't listen, they are completely lost and they have no idea of what's going on.	I-Mar08-STs-KS/LD-D
E54	[The differences in the classes are] Just the kids and their respect for others, control of what they say. Like Rick and Erik, I partnered Rick with Greg in the lab because I knew, I not only like Greg very well, but I knew Rick would be tolerant of him, at least nice to him, so that would cause less problems there. I think Erik and Craig would do the same thing.	I-Mar08-STs-KS/LD-RIOA

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E55	[When my cooperating teachers videotaped me] It was a good process, cause I watched like the volcano one where I knew a bunch of stuff and I was very comfortable and then I watched a glacier video of me teaching. And I had taught myself a couple days before all the stuff about glaciers, so it was so new to me and that was interesting, to see the first couple of times I taught that. I could tell that I thought about things more before I said them or was a little slower about it to make sure that I said it the right way. But then once I got more comfortable with it I could see the difference, those little things.	I-Mar08-STSC-SA-C
E56	Oh, I don't now what my closure was with these guys, I should have explained all of, I should have explained graphing a little more. Every class I think I could have done that. Most classes can figure it out on their own. Did I explain the graph before? I think I might of because it's drawn up there.	I-Mar08-STSPCK-D
E57	Umhm, they listen, sometimes they ask more questions. But this is stuff like, we've done a lot of entropy and entropy kind of things, and I'm like these equations just, you know, I don't think they need practice putting in numbers. So, I talked to Mrs. Black about that to see if she agreed, if she wanted them to have these for later use. After this they have their homework and then they got to it right away and got it done. One of them got other homework, which I don't mind with these guys. Earth Science kids, I don't let them do that because usually they have something they could work on for Earth Science than do something else. Most of the time it takes them the rest of the class to work on their homework, but today the notes were so short and their homework assignment was short so they had that spare time at the end, which I'm okay with giving these guys.	I-Mar08-STSPd-D
E58	[I think the best approach to use with these students is] a little bit of both, [teacher centered and student centered] because sometimes when they read, they like to read really fast and be really quiet. Then nobody listens, but they don't listen to me either so I try to get a little bit of both, Like Seth read this one, like he started to read this and then I said, no number 1, and we read it. Then I was like, why do we want to read all of these?	I-Mar08-STSKS/LD-D
E59	Laurie, the girl who's talking now, I was like, to pry for the answers, like just kind of tell me. I struggle not to give it away to her. Other kids I can give more subtle hints.	I-Mar08-STSKS/LD-D
E60	I think if I were to redo this lab with these guys I would have assigned them what station I wanted them to be at because this group was all in this back bench where we are right now, those two groups, they distracted each other a lot. Kristen and Todd were there and then Erik's group. Erik and Kathy are dating and if they're ever close to each other like that it's like flirty, like they want to hang out. Now when they are separate they are really good workers, it's just that they distract each other. Plus having all those guys like Don and Todd over there in the way, they'd be able to talk to everybody as they came over there. I want to move that around a little bit. my explanation, I think as far as my demo went just as well as the other classes. I think there's always something little, like I wish I would have said this first or forgot to say that.	I-Mar08-STSCM-D
E61	Seating arrangement, I think by keeping them away from each other and I need, like if I had them at the beginning and I realized this I would lay out ground rules, as far as my rules, I was sticking with what Valerie and Rachel do in their classes too keep it consistent for the kids. But I was thinking about doing some kind of point system with these guys because a lot of them are worried about their grades. And if they have daily points and they lose points, if they say a rude comment, or if they're not listening or talking.	I-Mar08-STSCM-D
E62	When I do notes, I stand over by Sean a lot or like sometimes they turn their chairs so they can see the TV and I have to stand between Sean and Greg so they cannot see each other. And that like cuts things off a lot and that's why I have Greg kind of behind him, because if they were across from each other I thought maybe that would allow more.	I-Mar08-STSCM-D
E63	I think that's where I'm too nice to them. I talked to Valerie and Rachel about this and I'm like, am I trying to be friends with them? Am I just not that kind of person? I think it's because I have, I've never really had to discipline anyone before and I don't really like being mean or someone or doing that. But I've kind of come to the point where I'm like, okay, I need to do this.	I-Mar08-STSIaS-D

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E64	I thought about doing that for a long time with them and then I started to see a little bit of improvement with me as far as managing them. Because at first I was kind of like letting these guys walk all over me, like let them talk and I wouldn't say much, I would just look at them, like "hello". But then I got a little better at handling it and I still think it would be better than what I do now. Especially with Cathy, because like I was talking to a few of them about it, I'd run some ideas by these guys, like what would you think if I did this? And especially Kim and Andrea, they were like, they are two of the girls that can control themselves more, are a little smarter. I asked them, I was like you know that might work, it was like a kind of elementary thing, I was like yeah, but do I need to do it? I talked to Caitlin and Cathy was like, Yeah! Then I can bring my grade up; I'd be quiet for that. I'm like why won't you be quiet? Like you know it's wrong.	I-Mar08-STs-CM-P
E65	Oh, I initiated, because she wanted me to add another class right away and I'm like, no, I can't. But then she pushed me back into it. She's like I'll give you two days and then I want you back in there. She's like, I know that it's tough and I know that it's stressing you out, but you need, I guess kind of experience that and get your confidence back up and get more experience in Chemistry. And like it was true, I didn't like it, but it was true.	I-Mar08-STs-AE/C-P
E66	Yeah, that was I had like, I was just so nervous and behind, I was freaking out about it, like I know this I did know it. But I thought I didn't know it well enough because, like all these kids are really smart, you know and I hadn't done this material for a few years. I'm like Earth Science I was behind getting my stuff ready, so I like to be a couple of days ahead of myself so I can go back and change things or work on something else. Gets to the point where the stuff for the next day I was making the night before and I didn't like that. I was like, I need to get out of this class, I was only supposed to be at like teaching 3 classes a day and I was teaching 4, or was I teaching, I was teaching 4 and the next week I was going to switch to 5. When it was supposed to be at half time, I was like I just need to back off for a second, like build into this.	I-Mar08-STs-PI-P
E67	With these guys, I thought about doing power point but it's kind of a pain to set it up and I feel like power point wouldn't be as effective with chemistry. But then I wanted to do a few overheads so then I could write and add a few things if I wanted. But the way to set it up is really weird. Like I'd have to be standing back, kind of among these guys and their desks there. Then I'd have to move everybody around so they could see, so I stuck with this just to get practice with it and see if I would like it.	I-Mar08-STs-Pd-RIOA
E68	I could have done better here. I didn't like interrupting Andrea like that, I was kind of rude, like Seth that was okay to interrupt because it was the wrong one, and I them to like be in the right spot, like Aerial, I like busted in all of the sudden.	I-Mar08-STs-InS-RIOA
E69	I think the other classes I said it, afterwards, or if they pause, they were like lever? I was like it's supposed to be level, it's my fault. But I think I tried to get it in really quick, before she kept readying on, but she's a faster reader so I couldn't get it in like that, and I was like, ah, crap.	I-Mar08-STs-InS-RIOA
E70	Oh, here, I think I interrupted Andrea right in the middle of that and I should have waited until the end. So when I did that, I was like, oh I completely disrupted this and now nobody's paying attention.	I-Mar08-STs-InS-RIOA
E71	You gotta have fun for your students to have fun.	FWJ-Jan-Apr08-STs-InS-D
E72	Be willing to change your lesson last minute.	FWJ-Jan-Apr08-STs-PI-D
E73	Have backup plans during your first couple of weeks until you figure out how fast your students work.	FWJ-Jan-Apr08-STs-PI-D
E74	I started out this semester trying to plan a week or two in advance but soon found it wasn't going to work that way, especially with writing formal lesson plans. I was constantly revising my plans and worksheets, even up to the day before. Part of that is because talking with my supervising teachers about my plans or seeing what they have done in the past. So I am still trying to plan at least a week in advance, just not as detailed as before. As long as I have a general game plan and know what is coming up in the next week, I don't get too stressed out about having to have every detail planned out too far ahead of time.	FWJ-Jan-Apr08-STs-PI-D

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E75	I feel like I am a very personable and friendly teacher. I have a very good relationship with most of my students and they seem to respect me. I've heard from one of the other student teachers that students say that they really like my class, so that really helps my confidence as well. Another one of my strengths I think is Volcanoes. Since I've been to Hawaii, hiked on the Volcano and seen lava, I get really excited talking about it and I think that will transfer to the students and help them to get excited about it too.	FWJ-Jan-Apr08-STS-InS-P
E76	I think I am very positive with the kids. I congratulate good ideas, questions, and tricks on how to remember certain terms. I like to make simple comments on their homework and tests such as good, nice job, or wonderful, especially for essays that they answered really well. I also complement them if they look good or have cute jewelry.	FWJ-Jan-Apr08-STS-InS-P
E77	I have two pet peeves. First is when students leave answers blank, especially when they are multiple-choice questions! They could at least narrow it down and guess. My second is when I give the class time for work, they get it done, don't want to turn it in and then lose it by the next day!	FWJ-Jan-Apr08-STS-KS/LD-P
E78	Also a few of my Chemistry students struggle a bit, so I usually sit with them at lunch and help them with their homework or stuff they are not getting while we eat.	FWJ-Jan-Apr08-STS-SR-P
E79	Lessons might flop, it's okay, just keep going.	FWJ-Jan-Apr08-STS-AE/C-P
E80	Student teaching is more work than you think.	FWJ-Jan-Apr08-STS-AE/C-P
E81	You should be able to accept criticism	FWJ-Jan-Apr08-STS-AE/C-P
E82	Essays and lab reports take forever to correct!	FWJ-Jan-Apr08-STS-Pd-RIOA
E83	I would still like to work on my classroom management skills, mostly with 7th period. But I feel like I have improved quite a bit. I'm just not quite to the point I want to be yet. I also think that I could know more about the subjects I am teaching, especially chemistry. As Mrs. White says I probably know more than I think, but I would really like to be an expert on what I am teaching.	FWJ-Jan-Apr08-STS-CM-RIOA
E84	Each day has just a few words, not even a sentence, per period. My other teacher uses a lesson plan book and also uses brief descriptions for each day.	FWJ-Jan-Apr08-STS-PI-T
E85	In the last couple of weeks I have expanded first from one binder to two and now I have expanded to four binders. I have a binder for chemistry, Earth Science, Random Stuff / Paperwork, and Other Subjects. I'm going to make copies of the materials my cooperating teachers have for other subjects to have as a reference for later.	FWJ-Jan-Apr08-STS-PI-T
E86	I use concept mapping a lot. I use it for some kinds who struggle. I will make one for them or make one with them, like the day before a test. Or I will make it as I'm trying to figure out how I'm going to lay out my notes, because I don't know how the sections go, like plate tectonics.	I-Apr08-STS-PCK-D
E87	[When I first used concept mapping in methods class] I thought this is too much work, I don't think I like this. But then after I did it, and I think about the lab form and I did that and it forced me to get into it and look at the concepts and stuff.	I-Apr08-STS-C/SA-P
E88	[When talking to Andrea and Michael], they kind of felt the same way. And just our worries like what if we don't like this, what if, I think Andrea and I were both worked about like discipline and stuff, like were we able to discipline anybody, do I really like doing it, thinking we might have problems. Good to hear that she had problems with it too, but was worried that she might have problems with it. So that I wasn't the lone teacher who didn't know how not to discipline, or know, yeah, so that gave me a little bit more confidence or reassurance that okay other people are still learning, still figuring this out. I don't have to do everything yet.	I-Apr08-STS-AE/C-P
F001	[From the video] I learned that I move, I thought about, whenever you suggested it, when you watched my Para, about moving around the room, so I tried to move around the room, and pay attention to everyone, I always, I recognized everyone, and asked everyone questions, and I think that was good, and I noticed that in the video.	I-May08-MS-IaS-C

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F002	I would also be sure to make time to draw what happened chemically on the board to further detail what exactly happened in the solution with the molecules.	RS-Feb08-MS-PCK-D
F003	If I were to perform this demo again, I would possibly try adding food coloring to the water to show a complete mixing of liquids.	RS-Feb08-MS-PCK-D
F004	I also think it is productive to encourage students during lab and to acknowledge their hard work and dedication.	RS-Feb08-MS-InS-D
F005	It paid off to work through the steps of the procedure before hand and to have questions formulated to engage the students during the demonstration.	RS-Feb08-MS-PI-D
F006	We greatly modified the instructional portion of the lab to target our extremely small methods who were pretending to be 10th grade biology students.	RS-Feb08-MS-PCK-RIOA
F007	Yeah, whenever, if I plan something, like, the way I plan the lab, I would think, okay, what's my main idea, what do I want students to get out of it, what parts of it am I going to put together to make them learn, to help them learn	I-Mar08-MS-PCK-C
F008	With the Vee, lecture is not necessarily connected with lab. Yeah, I've had a lot of lab classes, with my fish and wildlife degree, I had zoology, mammology, herpetology, ornithology, ichthyology, everything, so I've had a lot of lab classes, and a lot of lab experiences, and, I could tell, a good correlation between lecture and lab. In which classes it fit together in my mind, and in which classes it didn't. and as far as the diagram goes, with the Vee, and showing how he put it all together, I feel like that's how I've learned. Maybe just because I know that's what works, and that's how I'm going to do it, it totally makes sense. It seems like common sense.	I-Mar08-MS-PCK-D
F009	I especially liked how Mr. S. handled the situation with the student after school. He was very positive and encouraging.	SRJ-Feb-Apr08-MS-InS-C
F010	I think it is very important to accommodate every student that has special needs in the classroom.	SRJ-Feb-Apr08-MS-SR-C
F011	Mr. S. even touched me personally with his speech as I was encouraged to look within myself and work hard to finish up my semester.	SRJ-Feb-Apr08-MS-laS-C
F012	This review [at the beginning of class] can be a useful assessment tool to uncover how well I did as a teacher in conveying the previous lesson to the students.	SRJ-Feb-Apr08-MS-laS-C
F013	If I were the teacher, I would have asked how the students thought they did with the lab. I would have encouraged the students to discuss why they made a good prediction or why they made a bad one. What could they have done better if given the opportunity again? This important discussion would have brought the ideas of the class together for the students. I feel this important time where the students really could have learned was missed. Overall the class went well today, but the wrap up at the end of the class was weak to nonexistent.	SRJ-Feb-Apr08-MS-PCK-D
F014	I also find it very important to review the previous lesson to get the students on track.	SRJ-Feb-Apr08-MS-Pd-D
F015	I have learned not to cram too much information into the students' minds. It is better at the 9th grade level to work slowly but proficiently to accomplish teaching objectives and goals.	SRJ-Feb-Apr08-MS-KS/LD-D
F016	I will definitely carry with me these classroom management skills to my classroom.	SRJ-Feb-Apr08-MS-CM-D
F017	I see myself as becoming a very motivational teacher.	SRJ-Feb-Apr08-MS-laS-D
F018	I hope to instill in them a sense of self worth and pride in what they accomplish.	SRJ-Feb-Apr08-MS-RWA-P
F019	I really want my students to work hard not for me, or for their parents, but for themselves.	SRJ-Feb-Apr08-MS-RWA-P
F020	I have been thinking about how I plan to discipline students in my classroom. I want to establish a mutual respect between myself as a teacher and my students. I think with this mutual respect there may be less of a chance for disruption in the classroom. I want my students to know that Mr. Fred's classroom is a place to learn not a playground. I will not tolerate the actions of disruptive students to lower the learning level in my classroom. I want my classroom to be a place where students can have fun and learn, not a place where they are going to be disciplined and commanded. I look forward to taking on the major responsibility of managing discipline in my classroom.	SRJ-Feb-Apr08-MS-InS-P

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F021	My motivation to teach comes from a desire to help others which is a great quality I have always carried in my heart. I want to be a teacher so I can help guide our youth through education as well as in life. I have been a student in the education system for many years and now I want to give back.	SRJ-Feb-Apr08-MS-KS/LD-P
F022	My number one goal for my student teaching experience is to practice time management in the classroom.	SRJ-Feb-Apr08-MS-AE/C-P
F023	This [paraprofessional] experience has enlightened me to the fact that I have a tough road ahead of me in student teaching. I look forward to the challenge and am ready to commit myself and work hard.	SRJ-Feb-Apr08-MS-laS-P
F024	My number two goal is to become better and more comfortable with writing lesson plans	SRJ-Feb-Apr08-MS-PI-P
F025	I also learned through this experience [Para] a little about classroom management on a discipline level.	SRJ-Feb-Apr08-MS-CM-RIOA
F026	Closer to the end of class, after the students felt a little comfortable with the new ideas, Mr. S. asked a few questions in the analysis category. These questions were noticeably more challenging for the students.	SRJ-Feb-Apr08-MS-PD-T
F027	With a little guidance by Mr. S., the class was able to achieve comprehension. Mr. S. asked these more difficult questions to assess how well the lesson went today and where it should go tomorrow.	SRJ-Feb-Apr08-MS-PD-T
F028	I really liked how Mr. S. began his first class after spring break. His words were encouraging and focused the students back on task.	SRJ-Feb-Apr08-MS-InS-T
F029	I like how Mr. S. uses a variety of methods for assessment.	SRJ-Feb-Apr08-MS-KS/LD-T
F030	I have been closely observing how Mr. S. handles discipline problems in his classes. It is amazing to me how the character of each one of his classes are so very different. He must adapt and vary the level of his disciplinary actions. In some classes, he can allow a little more freedom due to the responsibility of his students. Other classes, such as his 5th period, would run ramped if given the opportunity to have any freedom.	SRJ-Feb-Apr08-MS-CM-T
F031	It is important for me to have set rules in my classroom and to enforce these rules equally to all students.	I-Apr08-MS-CM-C
F032	It's definitely going to be something I need to work on, is. . . if I manage my space on the board, because. . . I guess I didn't really have a plan, but I know that I need to, about how I write on the board. Because I wanted to fit all of the ideas on the board, but I had to erase one or two, and then that might have been confusing to them. I mean, they definitely got the idea of what was going on, but it could have been a little smoother.	I-Apr08-MS-PI-D
F033	I noticed that I was, I thought, I was organized, and I kept it, kind of, I don't know, I was real relaxed.	I-Apr08-MS-KS/LD-RIOA
F034	I think it is important, as we learned just the other day in Methods, to cater to the learner's needs and learning abilities. Not everyone thinks the same.	I-Apr08-MS-KS/LD-C
F035	I think I did a good job stimulating the students to work together to develop ideas and relationships by asking intuitive questions.	RS-Apr08-MS-C/I-D
F036	Yeah, well with the one thing I already commented on [in microteaching reflection], with the flowing of the notes. . . kind of. . . disorganized a little bit. . . that was definitely a good comment, I need to work on that.	I-May08-MS-PI-C
F037	But this [teaching a lesson in method class] does help out, because then you have it, I mean if you have it in your lesson plan, for next year, if you can look at it and say "oh yeah, this is how I did it", and you can look at it and see it real easily and not have to think, or try to remember exactly what you did."	I-May08-MS-PI-D
F038	Stephanie and I were proud of ourselves for executing a well planned lesson in the absence of our third group member. It was nice knowing that we could adapt on the fly to sudden changes which we will surely be faced with as teachers in our own classrooms.	RS-Mar08-MS-AE/C-RIOA
F039	Challenges are, there's a lot of different learning levels because different student education levels in the class. There's some students that really get what's going on, there's some students that kind of lie in the middle and some that are way out in left field, that's definitely a challenge, just trying to keep it interested enough for the student that gets it, but not so difficult and unmanageable like I know chemistry can be because they're not seeing this. They're not seeing these orbitals, they're not seeing these electrons flying around, you know it's not a visual thing.	I-Sept08-STS-KS/DL-D

APPENDIX J CONTINUED

F040	Well I knew that just from experience that sometimes I learned at a different pace than others, you know, when I was in school, in high school or in college	I-Sept08-STs-KS/DL-D
F041	They're actually doing something and not just hearing me say everything. So some of it I think I did realize before, I'm learning more as I'm doing it.	I-Sept08-STs-PD-P
F042	So I feel like I'm making better connections with students and I'm kind of understanding how they're working from grading all their papers and seeing the progression with the different assignments if we're on the same topic, you know, seeing if they're getting better or worse.	I-Sept08-STs-KS/DL-P
F043	So I think some of the ninth graders coming up they're just kind of walk thru and get shoved through but they are going to realize that they are going to fail. I don't know if my belief with teaching has changed with them because I knew there was going to be that kind of student, but I don't really think it's change.	I-Sept08-STs-SR-P
F044	Just practicing; just knowing that I'm going to do it, get up there and go through the lesson that I practiced at home. Getting up there and doing it. I guess the more I do it, the more experience, the better I feel about myself doing it.	I-Sept08-STs-AE/C-P
F045	Mr. Farmer told me to try the smart board. No worries if I struggle but I made it.	I-Sept08-STs-PCK-RIOA
F046	Well one time I made an announcement 'okay, can you, can everybody see I'm working with this student right here? You need to be patient, everybody's going to get their turn'. So, I'm just trying to teach them some manners too.	I-Sept08-STs-CM-RIOA
F047	I try to find the line of, mentally I think just do it as a percentage. Like it looks like okay if I just take a quick scan of the class, there's twenty students, how many are still working on it, physically working on it, working on it well, how many are just fooling around with it, you know.	I-Nov08-STs-Pd-C
F048	What worked about that lesson was the first part of the lesson were new systems that we had talked about and the students were involved, there was good energy in the room and there was interaction, good questions, good discussion, that worked really well. And the second half they got to sit by their friends, they got to chat a little bit and have fun, but they were also getting their labs done, getting their work done.	I-Nov08-STs-InS-C
F049	No, I was just, it's back to where if I, if he wasn't there and I didn't know the answer to that question, I would just tell the student, 'you know, I could look that up for you tonight and I'll find out more about it and I'll get back to you tomorrow'	I-Nov08-STs-SR-C
F050	By helping students out individually, getting around to the different students, helping them at the level they're on, not just thinking that everyone's on the same pace, teaching all to the students that are on track like Molly or Lauren because they're on base, they know what's going on.	I-Nov08-STs-C/I-D
F051	Now I want them to think, "okay so the reason why there's only one proton and one neutron we're assigning an atomic class unit of just one to them because they're about the same weight, like that's how much they're mass is how matter is in those subatomic particles, and that's why there's so many more electrons it would take to equal the same amount of protons or neutrons".	I-Nov08-STs-PCK-C
F052	I liked the way I asked students questions and gave examples to help them understand.	I-Nov08-STs-PCK-C
F053	I think I would have been able to talk about the nuclear powered reactors and how they use heavy water to cool things down and maybe that would have triggered my mind to think about the Hadron accelerator.	I-Nov08-STs-PCK-C
F054	I gave good clear directions of how to perform the activity lab. The lab was inquiry based a little not totally cook book format.	I-Nov08-STs-C/I-C
F055	Good transition between activities.	I-Nov08-STs-C/SA-C
F056	Good use of the dry erase board.	I-Nov08-STs-Pd-C
F057	I also struggled with enlarging the screen and hiding items I did not want the students to see yet.	I-Nov08-STs-Pd-C
F058	I noticed I could say "you guys" a little less often	I-Nov08-STs-InS-C
F059	There's good interaction. A couple of the students answered, instead of just one answering, when I asked how many kidneys we have. And they were guessing where they were and I was telling them where they're located. I thought it was good interaction between the students and the teacher.	I-Nov08-STs-InS-C

APPENDIX J CONTINUED

F060	I notice on the video clip now the two boys up front, they're fooling around a lot. They got to pick their own seats and I told them today that if they continue to fool around and not do their work, then I'll, I'm going to have to separate them.	I-Nov08-STs-CM-C
F061	I liked the way I asked a student a question who was not paying attention to bring him back on track.	I-Nov08-STs-CM-C
F062	I liked the way I shared stories with the students but quickly brought them back on track.	I-Nov08-STs-CM-C
F063	I think it is important to move around the classroom and I did a good job. I make good eye contact with students and projected my voice well.	I-Nov08-STs-CM-C
F064	I want to comment on whatever else I see in this, because on the last clip I could have commented about the one student that the camera is showing. She was turned around, she was talking, I don't know if she was on track or not.	I-Nov08-STs-CM-C
F065	No, I just wanted to mention, I try whenever I'm talking, because the way the room's set up, it's like two-sided. If you're looking at this side, talking to this side, it's kind of difficult to see over here to make sure they're. Okay, this side of the room, am I teaching to just this side of the room or am I teaching to everyone? So I think that's kind of tough for me to make sure I'm looking at everyone, I think I need to work on that.	I-Nov08-STs-CM-C
F066	Yeah, like little finger boards, so that's why I laughed. I'm always asking them to put them away. I've asked them after class so next time I see it I'm just going to take it and I'll give it to them back after class or something. Hopefully they'll quit bringing it into the classroom because it's pretty disrupting. I was just trying to get class going;	I-Nov08-STs-CM-C
F067	I routinely checked the clock to allow for multiple activities.	I-Nov08-STs-AE/C-C
F068	I think they realize they know, if I'm looking for an answer from the class and nobody's getting it, a lot of times we'll make eye contact because I know they'll have it and they'll raise their hand and say it. So they'll realize that they know what's going on, maybe I shouldn't shout it out all the time because Mr. Fred's trying to get responses from other students.	I-Nov08-STs-IaS-C
F069	What happened there was I was showing them about, I was kind of introducing what we are, well I was explaining balance electrons. And electrons are shells and the maximum number of electrons that go in shells and then I gave them the example of potassium because in the last class, they're like what's up with potassium? There's 19 electrons, what do we do? Well I better go over that with this class. So the one student, Lauren, she realized that, okay I said that they want a maximum of 8 in their outer shell because of the octet rule and we're going to go into that more tomorrow. But she noticed that there was one more electron hanging on the outside and I said that they wanted to have eight on the outside so she made the connection, "oh, so that's why things, elements bond together and they make compounds". So that was cool, she's like "oh that's why they", you know, really light bulb in her head clicked, and uh that was cool. She like could figure something out on her own so that was exciting.	I-Nov08-STs-C/SA-D
F070	So I said that I would get with him or I would figure it out on my own and get back to them. So I have to make sure that I'm going to go over that with the whole class tomorrow after the Hadron accelerator. Then I'll start into compounds.	I-Nov08-STs-C/S-D
F071	Well I realize that I can't put too much in a lesson. They're not, I don't want to say that, they pick up on things but it seems like what works well for my cooperating teachers is going at a slower pace, making sure that everybody's getting everything instead of too much information. Because more than just a couple concepts is too much for some classes.	I-Nov08-STs-KS/DL-D
F072	Obviously, the technique of saying 'okay, can I teach now, is it okay?' I haven't done the countdown thing. I tried, Farmer mentioned writing their names on the board, I did that whenever I started taking over sixth period and they were really out of control I said, you know, 'If I mention your name 3 times your name goes on the board and you have to stay a minute after class during the passing periods, in that time since you're taking the time out of my class'. And that seemed to work pretty well, I haven't had to do that again, I don't feel. There were some kids Mr. LeFleur thought they weren't respecting me well enough and he pulled them aside before class and talked with them.	I-Nov08-STs-CM-D

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F073	They'd be like "Mr. Fred, Mr. Fred" whenever I'm standing over another student helping them. So I try to teach them like a little bit of patience, you're going to have to wait your turn until I'm done with this student	I-Nov08-STs-CM-D
F074	I was thinking that I prefer to use it to start class tomorrow. Because tomorrow I have, tomorrow is a 1, 2, 4, 5 _____ so I have both biology's the same day so I could do the same thing back to back. And I was going to, I didn't even mention it, I kind of didn't think to really mention it in class today, but I was just going to start, we already talked about it second period so they already know what were talking about but I would just start off class by saying 'hey we, just so you know there's scientists in the world trying to discover things today. Has anybody heard about the Hadron proton accelerator?	I-Nov08-STs-PI-D
F075	Now it's different, it's actually what's working for this student, for you and the student. So now it's more of a connection, how can I get this to come across correctly so they understand it.	I-Nov08-STs-KS/DL-P
F076	I think it's rewarding I said after class one student stayed for a few minutes because she said she didn't get what was going on and she wanted to understand it better. I like helping her out because I've helped her out several other times, she's come in at lunch or stayed after for a few minutes and I think that's rewarding, to help her out.	I-Nov08-STs-SR-P
F077	I didn't realize, I don't know why but I didn't realize that grading took so much time. It's a pretty big effort, I'm trying to, I realize I have to keep up with it and I have to do a little bit of grading every day, it seems like. But I'm kind of on top of it now and things are going pretty well. I grade for first and second period and sixth period and kind of took over fifth period grading. But it's a work in progress.	I-Nov08-STs-AE/C-P
F078	I have 30 students and like I was talking to my Mom earlier, this one is way back here on step one, this one's on step 10 and this one's already done, looking for something else to do. This one wants to go to the restroom, this one needs to go to the nurse, this one needs this, this one needs that. I'm just realizing that, I know everybody's going to learn at a different pace but just trying to manage it all and to keep everyone going and doing something and not to have kids bored and to keep students disciplined. Some students are well, not really behaved and trying to stay on top of them, but not let them distract class too much.	I-Nov08-STs-AE/C-P
F079	I'm always nervous, okay, is this going to fill the class, is it enough time or I don't feel like I cramming too much stuff in because I don't want to do that. But I think teaching it again the second day I feel more confident, I definitely do.	I-Nov08-STs-PI-P
F080	I just wanted to introduce the reproductive system and Mr. LeFleur said don't go into it, it will just get crazy and out of hand, you know, they're ninth graders.	I-Nov08-STs-PCK-RIOA
F081	This was the first trial run with the clicker as an assessment tool. The students liked the technology and Mr. Farmer and I enjoyed the electronic grading.	I-Nov08-STs-PCK-RIOA
F082	So I was trying to talk about isotopes and different types of hydrogen and yesterday I think it went a little bit better as to why I got to, why there is heavy water and what it's used for. So I think this class got the idea, okay there is heavy water, there is this thing heavy water, but what do we use it for?	I-Nov08-STs-PCK-RIOA
F083	I just try to make it interesting somewhat to them and if it's not, and if it's not interesting to them I at least try to get them working on something.	I-Nov08-STs-RWA-RIOA
F084	Yeah, we were talking about, he was asking, the student was asking why he can tell the difference between when he touches a table and it's a smooth surface, or if he touches his binder and it's a textured surface and he said it was because of this system, in the system organs we have sensory receptors and they send a stimulus from your nerves through your body up to your brain, and your spinal cord into your brain stem and to your brain. And then that tells you what you're feeling.	I-Nov08-STs-C/SA-RIOA
F085	And then I think it also worked that they had a work sheet to work on and I got around to the different students to make sure everybody was doing it, everybody was doing it correctly, any misconceptions they had they could ask me as I was coming around, I think that worked well	I-Nov08-STs-Pd-RIOA
F086	At the beginning of class, I liked the way I started by asking about their homecoming weekend. I think it is important to remain "human" with my students.	I-Nov08-STs-KS/DL-RIOA

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F087	Sometimes I'll even say "if some of you understand, help your neighbor out" and I did say in this class don't help your neighbor out by just giving them the answers and letting them copy your paper but help them out by getting them to understand.	I-Nov08-STs-CM-RIOA
F088	Blake, he's a good student, I know he understands a lot what's going on but I don't want him, he had a book open, he was reading a book. And Josh always likes to talk, he's the student that sits next to him and he was reading, he had a book opened in front of him, I don't know what it was, some book he brought from home. Josh was talking to him, he was looking at Josh talking to Josh and I was up there teaching. And they weren't on track with me at all. So I was trying to bring them back on track	I-Nov08-STs-CM-RIOA
F089	Right there I'm helping a student out with, we're still working on drawing atomic structures. Seemed like I got around to most of the students and everybody is on the right track.	I-Nov08-STs-CM-RIOA
F090	He was just trying to copy her work, so I stopped him from doing that and tried to get him interested in _____ have to talk to him about that too, he's rarely ever in class _____ at least he's there and he's trying to do something.	I-Nov08-STs-AE/C-RIOA
F091	So they were asking about, "well, adrenalin rush, what do you mean superhuman strength?" and I didn't really thoroughly understand how it all works. I know that adrenalin makes you pumped up, makes you, it gives you more energy, you can do more things. And I know that it's pumped from the adrenal glands into the kidneys and it goes through your body and it's really quick, kind of boost. But that's pretty much the extent of my knowledge on adrenalin.	I-Nov08-STs-AE/C-RIOA
F092	I'm glad that they were asking questions, it showed that they were engaged, they were interested. I liked that they had questions. I thought they were good.	I-Nov08-STs-IaS-RIOA
F093	I also taught IS-9 period 6. I felt a little more comfortable today. Having 30 freshmen do a lab in class is quite a task. It is very difficult to keep them all focused and on task. I can tell that we should keep labs simple and brief.	FWJE-Sept-Dec08-STs-PCK-C
F094	I attempted to help review them for their open note quiz. Most of them acted as if they understood scientific notation and metric conversation after I reviewed. Turns out from grading their quiz that only 3 out of the 23 or so that took the quiz grasped the concepts.	FWJE-Sept-Dec08-STs-PCK-C
F095	I feel a little uncomfortable in front of Mr. LeFleur's IS-9 class. Actually, it is not so much his class as it is Mr. LeFleur himself. I need to be a little more confident in myself and I think this will make a big difference.	FWJE-Sept-Dec08-STs-InS-C
F096	After everyone completed the exam, I explained the pond water lab to the class. I was not totally comfortable explaining the lab and it showed. The class did not follow along with me when I explained Field of view and microns.	FWJE-Sept-Dec08-STs-CM-C
F097	I would like to have a class where I could walk around the perimeter of the desks. That way, I would be able to be close to all students at some point of the class.	FWJE-Sept-Dec08-STs-CM-C
F098	I think the students need to take responsibility for not being prepared for the exam but I also take responsibility. I think Mr. Farmer and I could have done a better job preparing them for the exam	FWJE-Sept-Dec08-STs-IaS-C
F099	Mr. LeFleur gave me some constructive criticism which I took really well. I need to be more firm. I need to keep things rolling (no long pauses), I need to be confident. I need to be prepared. And I need to manage the class.	FWJE-Sept-Dec08-STs-IaS-C
F100	I did not get the students started with the lab because I thought there were only a few minutes left of class. Yet, a mistake. I actually had 10 more minutes of class left. Being frustrated, I left the rest of the class for free time instead of reviewing FOV and measuring in microns. I will definitely have to review this material before I allow them to start the lab on Friday.	FWJE-Sept-Dec08-STs-AE/C-C
F101	The program grades the students automatically. The down side is there is no short answer or essay questions on the exam. The highest score on the exam was an 89%.	FWJE-Sept-Dec08-STs-RWA-D
F102	I tried to have a nice pace that governed student learning.	FWJE-Sept-Dec08-STs-CM-D
F103	After the class was half over, I noticed many students still needed to finish. I figured it was best to let the students do their labs as well as their missing assignments.	FWJE-Sept-Dec08-STs-AE/C-D

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F104	I am glad I spent this afternoon helping out Brian and getting to know him. He is an exceptional individual from whom I expect to learn a great deal from.	FWJE-Sept-Dec08-STS-C/SA-P
F105	I also shared a personal story with the class about meeting Flavor Flav. I definitely felt more comfortable in front of the class today. The class is a little smaller than the other bio class and I think this helps me to relax.	FWJE-Sept-Dec08-STS-KS/DL-P
F106	Before I began teaching I was a little nervous but mostly anxious and excited.	FWJE-Sept-Dec08-STS-AE/C-P
F107	Some of the questions on the pre-test were challenging even for me.	FWJE-Sept-Dec08-STS-IaS-P
F108	The entire test is multiple choice or matching. We entered the answers to the exam into the clicker program. We will try to have the students use this assessment for the exam too.	FWJE-Sept-Dec08-STS-RWA-RIOA
F109	To use their notes for the scientific method, metric conversion quiz. Most of the students had a difficult time. The problem is they do not pay attention during class. Mr. LeFleur also reviewed everything that was on the quiz directly before administering the quiz - amazing!	FWJE-Sept-Dec08-STS-RWA-RIOA
F110	I went to a local pond to collect water in hopes of finding more organisms.	FWJE-Sept-Dec08-STS-C/SA-RIOA
F111	The students really enjoyed lab today. They got dirty and down to business collecting their organisms. After collecting their organisms, the students came back to lab to create their Ecology book.	FWJE-Sept-Dec08-STS-C/SA-RIOA
F112	During period 6 today, the class got out of hand a few times. They are definitely seeing how far they can test the water with me.	FWJE-Sept-Dec08-STS-CM-RIOA
F113	Once I got started teaching, I had to put my foot down. I started a new discipline action by writing names on the board and holding kids after class during passing time. This new method helped with classroom management.	FWJE-Sept-Dec08-STS-CM-RIOA
F114	One student repeatedly asked questions that were not appropriate to the topics covered. They were science questions but he was trying to be disruptive. I was not sure exactly how to handle him. I knew he was trying to fluster me or get a rise out of me. I stayed calm and curbed his questions.	FWJE-Sept-Dec08-STS-CM-RIOA
F115	The most difficult duty for me was keeping everyone on task. Most of the students needed a constant reminder to keep them focused or otherwise they would have never completed the assignment.	FWJE-Sept-Dec08-STS-CM-RIOA
F116	During lunch a few students came in to make up their biology exam.	FWJE-Sept-Dec08-STS-SR-RIOA
F117	During lunch, I helped Naomi complete her intro to lab. She struggles to keep up but she is very motivated.	FWJE-Sept-Dec08-STS-SR-RIOA
F118	I went over Joe Smith's IEP with Mrs. Dwyer. She taught me about Joe's strengths, weaknesses, goals, and accommodations. She suggested certain accommodations to help Joe in some class.	FWJE-Sept-Dec08-STS-SR-RIOA
F119	I did not have a whole lot for students to work on. Well I guess I did but I did not stay on top of everyone to get it done. I was busy trying to get everyone on track with missing assignments.	FWJE-Sept-Dec08-STS-AE/C-RIOA
F120	At lunch and after school, Mr. Farmer and I prepared for the quiz, review, and exam. We are trying to use his clicker system for all three of these. We got most of the kinks worked out but I'm not sure we'll have everything ready. Mr. Farmer is going to work on it more this evening.	FWJE-Sept-Dec08-STS-IaS-RIOA
F121	Mr. Farmer and I definitely do not have all the wrinkles worked out with his click system. It almost seems like more hassle than its worth.	FWJE-Sept-Dec08-STS-PI-RIOA
F122	My third lesson learned in first period today was to pay attention to the clock. I lost track of the time and the bell rang. Students had to rush to clean up.	FWJE-Sept-Dec08-STS-PI-RIOA

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F123	That makes me show that, I feel that it is important to not act superior to my students. I think that they should know that Mr. Fred is human, he's just like me, he's just like, you know, the student sitting next to me. He's going to forget things; he's going to make mistakes and it makes me on the same level as them a little bit more. I think it's a better connection instead of always, I don't want to act like I know something, or that, you know, act superior to them, I don't think that's right.	I-Dec08-STSKS/DL-P
M001	So I think it's [the video] great and I think it always brings in a new perspective from which to look at your own performance. I don't think you can ever have too many...	I-Sept07-MS-IaS-C
M002	Going into the assignment, I was more worried about the demo itself and making sure that it was working, relying entirely upon my own interpersonal skills to create a concise, clear presentation of the concepts related to buoyancy and density on the spot. This was my downfall. I now realize that the material and the demonstration was only half the battle.	RS-Sept07-MS-PI-C
M003	I find that when I get in front of the class, I tend to use a lot of focusing phrases such as like, umm, hmmm, ah, etc. when I lecture or discuss content.	RS-Sept07-MS-IaS-RIOA
M004	I have always been someone that values spontaneity, and prefer to "go with the flow" as opposed to planning everything out. However, this lack of planning could be a reason why my lectures or class discussions are littered with these phrases.	RS-Sept07-MS-PI-D
M005	I look at my attitude and game-plan prior to my demonstration and realize that I was teaching the subject in a way that would have appealed to me. I now need to be able to address other styles of learning and cover all of the necessities the maximum number of students.	RS-Sept07-MS-IaS-C
M006	I put virtually zero prior thought into one of the major components of teaching, and that is a sloppy practice.	RS-Sept07-MS-PI-RIOA
M007	I should have spent at least as much time preparing a concept map to make clear to myself the connection between the different concepts displayed in the lesson.	RS-Sept07-MS-PI-D
M008	This problem could be helped by supplementing my lectures with visual aids such as overheads or a Power Point presentation that could take the focus away from my speaking, or by simply scripting my lecture questions and spending more time preparing what I want to say.	RS-Sept07-MS-PI-D
M009	My initial realization [upon watching the video] was that I need to practice more. I wasn't clear on some things, I stumbled, I used a lot of focusing phrases like "um, ands, so and like" and I feel if I had organized myself and prepared better, then I could have gotten rid of that. This is the tool to do that.	I-Sept07-MS-IaS-C
M010	I guess it's something else to consider when planning lessons and everything else, how people will prefer to learn because of their personality type.	I-Oct07-MS-KS/LD-C
M011	I really start to think, again, about all these things I learned about in the past, critically, and analyze it, in a sense of how do these teachers utilize these types of concepts, these learning theories, the pedagogy, epistemology, everything else in their classroom? What approaches do they use? How would I do it differently	I-Oct07-MS-PCK-C
M012	My first and foremost job is to make these students better learners and to educate them about the ideas of physics and help them to prepare to be better students and better people.	I-Oct07-MS-KS/LD-P
M013	Also, as one comment suggested, if we had included an image of the peppered moth and other examples of cryptic coloration, then the lesson would have been enhanced for visual learners.	RS-Oct08-MS-IaS-D
M014	Also, depending on the students' abilities, the amount of guidance though the procedure could be adjusted to fit the students' needs.	RS-Oct08-MS-KS/LD-C
M015	An effective teacher must be able to draw out connections and conclusions that explain and relate the students' observations to the science content of the lesson.	RS-Oct08-MS-PCK-D
M016	In the past, a team teaching was just another group assignment, broken into individual parts, and delivered as such. For this, I've always hated team teaching assignments. On this particular one, however, our group was much more thoughtful and critical of what we were going to teach and how we were going to approach it.	RS-Oct08-MS-IaS-RIOA

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M017	I've always been able to rely on my natural ability to interact with people when I've been in a teaching situation, but I'm beginning to realize that that isn't enough.	RS-Oct08-MS-IaS-P
M018	On the other hand, we really liked the simulated environments and felt they gave the students a realistic scenario, and doubled as a way to open the lesson and get the students thinking about the relevant concepts.	RS-Oct08-MS-RWA-D
M019	The class was engaged and they seemed to enjoy themselves while learning. The overall reaction from the class was positive. And together we felt good about our teaching experience.	RS-Oct08-MS-IaS-C
M020	We also could have given students questions to keep their attention while waiting to move to the next station.	RS-Oct08-MS-Pd-D
M021	A teacher can definitely ensure that their students are getting a more balanced diet of Bloom's questions by scripting their questions ahead of time taking care to create questions that challenge the students at all of Bloom's categories	SJR-Sept-Nov07-MS-Pd-D
M022	Before I taught my lesson, I went through the lab and scripted my questions.	SJR-Sept-Nov07-MS-PI-RIOA
M023	I also need to work on a more strict organizational system.	SJR-Sept-Nov07-MS-PI-P
M024	I then worked as a counselor for the Peaks and Potentials program at MSU for two weeks, and I enjoyed the job, especially the interactions with all of the kids. The week after the camp ended, I changed my major to Education with an emphasis in general science broadfield. I wasn't exactly sure why at the time, but it seemed to fit much better than Engineering.	SJR-Sept-Nov07-MS-IaS-P
M025	If the students were restless, she would have them come up to the front of the room for their paper instead of returning it to them. These seemed like small things to pay attention to, but it impressed Michael that she would care about the students this much.	SJR-Sept-Nov07-MS-KS/LD-T
M026	It is also good to note that certain lessons lend themselves to lower or higher levels of questioning. For example, an introductory lesson on a new concept probably shouldn't try to have the students synthesizing the information or evaluating the procedure on the first day the students are exposed to the information.	SJR-Sept-Nov07-MS-Pd-D
M027	My cooperating teacher admitted that he should script his questions but never does anymore.	SJR-Sept-Nov07-MS-PI-T
M028	This process allows her to check right after teaching a lesson whether or not her students have understood the concepts of the lesson, and can immediately decide whether she should spend more time going through example problems.	SJR-Sept-Nov07-MS-Pd-T
M029	I think I've gotten lazy in that aspect and that's one thing that tutoring does to you. It kind of hurts you in a way that you almost get into that bad habit of doing that kind of stand up, using the chalk board and lecturing.	I-Nov07-MS-IaS-P
M030	Overall I will always try to approach something from different angles. Show them maybe a definition and then give them a picture or a video, something you can view from different perspectives and different learning styles so that auditory learners can hear the definition, visual learners can see the example.	I-Nov07-MS-KS/LD-C
M031	I really focused on developing a set of five lessons that flowed into each other and complimented one another.	RS-Nov07-MS-PCK-RIOA
M032	I think the unit will be effective in sparking the students' understanding through inquiry and experimentation.	RS-Nov07-MS-C/I-D
M033	So I think that's trying to find the happy medium between that really hard-nosed, don't smile at all style teacher and somebody that is still able to get along with their students.	I-Dec07-MS-InS-P
M034	A proper closure with some connections between buoyancy and real-world application would have likely sparked a few more questions.	RS-Dec07-MS-RWA-D
M035	I should have passed around the objects when asking for predictions about their buoyancy.	RS-Dec07-MS-PCK-D
M036	I think if I were to teach this lesson again, I would set aside at least 10 minutes for discussion at the end.	RS-Dec07-MS-Pd-D
M037	The only other thing I really wish I had included before jumping into the activity was a quick review of the vocabulary words associated with my lesson.	RS-Dec07-MS-Pd-RIOA

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M038	Throughout this course, the two previous microteaching experiences have been a bit lackluster due to a lack of preparation. I certainly wasn't going to let that happen this time. I spent a lot of time organizing my thoughts and scripting my questions in order to prepare myself as best I could.	RS-Dec07-MS-IaS-D
M039	But there's none [standards] about physics.	I-Feb08-STC-C/S-D
M040	I had researched the Washington State standards kind of before, going into this interview to talk to the, meet the teachers, what do they expect, what are the school district's standards. Everything is to the Washington State standards that they test on, EALR's is what they call them there,	I-Feb08-STC-C/S-P
M041	Well yeah, it would be one of those things where it's teaching academic skills, it's not just teaching Biology, but I'm saying this is a good skill to have. How beneficial is this notebook, they can take it home, easy to study. All of their notes are there, all of their homework is there, all of their quizzes, tests, labs, it's all right there.	I-Feb08-STC-PCK-T
M042	Yeah, I don't know what else you want me to do. And so, it is, I always do. The part of assessment is not to assess the student but to assess the teacher as well. Especially if everybody did poorly on it, then, ok maybe I need to look at going back and saying, ok let's revisit this.	I-Mar08-STC-IaS-C
M043	Yeah, so I think I would hold off this, maybe do a quick little demo, we're going to talk about collisions, you're going to do about it tomorrow, just to get their attention, keep them interested and then go right into the lab first and then break it down with the lecture the next day. Because then you can ask students, what did you observe, and really engage in that scientific process as opposed to just engage in whatever lab, lesson that you had them working through. It's actually from your observations, from your lab, use your tables, think about it.	I-Mar08-STC-PCK-D
M044	But the hard part about it is, and I had brought this up to earlier on, something I had got from Betty in the Math Methods class was this idea that if the student doesn't perform the first time, what's wrong with giving them a chance to correct their work and perform to that level you expected a second time for some partial credit.	I-Mar08-STC-SR-D
M045	Yeah, it is important to go back over and say, especially if it was a question that was commonly missed, by a lot of students, then I always go back and say ok, what was the mistake with this type of. A good example was today in the Math class, there was kind of a problem with a lot of repeated questions with one of the problems on the work sheet.	I-Mar08-STC-IaS-D
M046	Yeah, and I felt like part of it was because I feel there's got to be some way to introduce to the students. There's got to be a learning curve of how do they incorporate, and you know maybe they've gotten some sort of lecture format and an outline format all semester long. If I were just to hand them a concept map and say, this is a concept map, they're going to look at me like 'Michael, what is this? This isn't all in order like you usually do it, this is all crazy'	I-Mar08-STC-PCK-P
M047	I felt like this is something I'm going to try in the future, concept map or concept map as a review activity, you know, let's talk about everything or as a closure to a lesson. Say, now we're going to make a concept map of all the stuff we talked about today. I like the idea	I-Mar08-STC-PCK-T
M048	So I say where are the standards? There's no standards for it because it's not a Wasal class. The Wasal occur in 10th grade, so everything is taught up to tenth grade and physics is not a tenth grade class, it's a twelfth grade, so I guess you can get away with teaching anything you want.	I-Mar08-STC-C/S-T
M049	Yeah and that's one thing where I typically try and bounce around the room and Cathy's always saying if you keep giving questions like that, just stop. Stop whatever I was doing and say hey, I'm getting this question a lot. Go ahead and listen along and if this is something that you're having some trouble with and if not you can just continue working on whatever, but	I-Mar08-STC-AE/C-T
M050	I do much better when I have this stuff planned out and again I was looking back on the first lesson plan and I was like, I know how to do this, I know what this stuff is, I'm a pretty good physics student, I can teach this to other people. I'm just going to wait. I remember what that was like and it sucked, I hate feeling that way, standing up in front of somebody and not knowing what to say. I don't like that. I like having some structure and some organization and having a game plan.	I-Mar08-STC-PI-T

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M051	Yeah, and it kind of sets up an attitude that, hey, I'm going to ask you a question and I'm going to show you how to do it, as opposed to I'm going to ask you a question and I want you to work through it.	I-Mar08-STs-Pd-C
M052	Looking at the time code, obviously you started filming at the beginning of the lesson, you realize how much time this takes, as well. That was another thing Becky and I talked about, throughout at some point in time, I don't remember if it was before this or after this, or maybe it was Christie and I talked about it, but my warm-ups were cutting into, taking up a good chunk of my instructional time. So that's why I like that idea of the daily quiz. The teacher either writes it on the board and has it ready for them or gives them a half sheet of paper to use it. And a lot of the time it's something from their homework where they can use their homework as a guide.	I-Mar08-STs-Pd-C
M053	Also, try to set the pace of the lesson to the students, not for what I plan.	I-Mar08-STs-KS/LD-C
M054	This classroom behavior may not distract me from my presentation, it may be distracting to their classmates and make it hard for them to focus.	I-Mar08-STs-KS/LD-C
M055	Some improvement that could have been made were paying closer attention to students' actions, for example popping of gum, drumming tabletops and clicking of pens.	I-Mar08-STs-CM-C
M056	After the lesson it was apparent through assessment that the students grasped and understood the concepts.	I-Mar08-STs-IaS-C
M057	This is the student feedback that I got from Physics and I may have that with me and it may be back at my house.	I-Mar08-STs-IaS-C
M058	This is the concept map and this is something that I threw in there this time because again, it was like this was day one of the new planning out, prepping ahead of time so I made a concept map for this unit and I never really went back into it. I tried to figure out different ways as to how I could start to do concept maps, how could I do the	I-Mar08-STs-PCK-D
M059	Well, you know I think what I'm going to do in future, and possibly even in a Math class, I haven't quite figured out how I am going to do it in a math class. But the Biology teacher, when she's giving lectures, all of her lectures are on power point, and then she'll do a power point that she's delivering and then a student version of the power point where she'll just go and erase the definitions and put in an underline instead. Then she creates the handouts, like 2 per page.	I-Mar08-STs-PCK-D
M060	Now we're talking about systems. The other thing I noticed, and this is a consequence of the curriculum. There wasn't really a curriculum when I went in there for physics, for math there was. There was a textbook, we used the textbook and we pretty much did the homework out of the textbook and we followed the textbook, and it's a set, stone guide. I think it's awesome. The other side of that is the curriculum, you get to pick and choose what you teach. The downside of that is you've got to come up with everything on your own, you've got to come up with homework questions, you've got to come up with test questions, you've got to come up with lab activities. It's just, it was so hard and I think, even if, Brenda said she didn't like the curriculum so she doesn't use it much.	I-Mar08-STs-C/S-D
M061	It's been about three weeks. After being finished up, I think as far as settling the class down, I've noticed a lot of the teachers it's part of their routine, it's something they do. Either it's a warm-up every day, or rules are when the bell rings you are in your seat or it's just a 'hey class', something. But something that, it's just like a Pavlovian bell, they ring it and they're in their seats and they're ready to go. Like some sort of conditioning, every single day. So I would want to work that in from day one so that this whole, like murmurs, quiet chatter, slowly taking books out, wasting a few minutes.	I-Mar08-STs-Pd-D

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M062	Yeah, have something that's the same every day, so the students just know to expect it and then they start doing it themselves, setting up that environment that is sort of a self-sustaining thing. Holding the students up, and then they'll start to do it. This first time gives me a chance to start, to take attendance, to do whatever. I like the idea of some warm-up activity that brings the students in. One of the teachers said, you know I don't like doing it with the older students because I don't think they take as much for it, they're a little more mature, it seems like something a little more juvenile, now we're going to warm up and get our focus on. I don't know, but I think it works for whoever. I think it's a way to assess, how will they get this, shall I just totally tank this from yesterday, shall I spend 15 minutes of my lesson on the material. So that's how I start the format.	I-Mar08-STs-Pd-D
M063	Yeah the only other thing, and I think I mentioned this in my paper, is that after they get done with this, I don't have the student walk through the solution, I do it for them. So that was the only thing I had, I remember watching it from last time, so yeah, we can skip ahead.	I-Mar08-STs-Pd-D
M064	Well in one I'm telling them and in two I'm having them show me. It's not really any type of assessment if I'm asking them a question and then answering it for them. It doesn't tell me anything about their abilities of working through a problem, it doesn't set up a scenario where I want them to make sure they know how to do it, it's just all teacher centered instead of student centered.	I-Mar08-STs-Pd-D
M065	So anyway, there's a lot of things that I think, part of it was for me to focus on and say, ok, how am I going to change, what am I going to do to collaborate with my colleagues that are teaching this course, you know. Colleagues that are teaching the course in the past, trying to get feedback, whatever, maybe that means videotaping, giving myself personal feedback because, the scary part	I-Mar08-STs-InS-D
M066	I think this was where I really started to incorporate. This was the beginning of saying, ok, lesson plans every day, formal lesson plans, typed out, a week and a half ahead of time. I also started to plan further and further ahead of time and incorporate a lot more demos in the lectures. This is where I started to do that and then the Waves Unit, I felt like was something that, I was really proud of the Waves Unit. We did a demo every day, at least one, even if they'd already seen the demo. It was something that was constantly a visual aid to help as I was going through, and they liked that, that was one thing they spoke about. Actually, I wonder if I brought that with me?	I-Mar08-STs-AE/C-D
M067	I guess the way Brenda did it, she wanted it to be. Because the last day of class I said, you know, students I feel like have a really good idea of the quality of teaching, you guys really know what's good teaching and what's not. So I was like, I don't want to put anyone on the spot, if you don't feel comfortable answering, but by all means you don't have to, but what can you guys say about, what worked really well, what do you like? Do you like this? Do you want? And we spent 15 minutes of my last day talking about it and then she sent out an e-mail asking a similar question, kind of a...here it is! So I guess it's praise. Most students like the following, and then constructive criticism. I haven't actually spent a lot of time looking through this, this was something she handed to me on my last day on Friday.	I-Mar08-STs-IaS-D
M068	I was content with my ability to integrate an assortment of educational tools, such as a demonstration, powerpoint notes and inquiry based questioning with discussion throughout the lesson.	I-Mar08-STs-PCK-P
M069	I found that knowing the students names was very beneficial when trying to get them focused and getting them involved in the discussion.	I-Mar08-STs-CM-P
M070	I need to look up at the students more.	I-Mar08-STs-CM-P
M071	make sure you have something for all students to do to keep them busy. If some are granted free time while others must work, the students with free time tend to be disruptive.	I-Mar08-STs-AE/C-P
M072	Preparation is everything. If you know where you are going to go with your lecture / lesson, you can focus on the many other things teachers must be aware of. Students paying attention, cell phones, students with questions, taking care of daily tasks, etc. If you come unprepared, your focus, by necessity is divided between the students and your own performance, in that you must adjust on the fly and focus on what comes next.	I-Mar08-STs-PI-P

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M073	It wasn't until my first example that the students were able to get back on track. Once a discussion was initiated about the topic the students were easier to engage. By the time I reached some of the more advanced examples in my presentation, most of the class was involved in the discussion.	I-Mar08-STs-Pd-RIOA
M074	I felt like it was tough to break things down because I was thinking like, what do I have to do next, got it, what's next, you know? I felt like the pace was the hardest part about teaching. No matter what, students are coming in tomorrow, I've got to be ready to go for them tomorrow.	I-Mar08-STs-AE/C-RIOA
M075	Right afterwards I was like kind of thinking ahead. After I sat down I was able to digest a lot of the information and debrief with it.	I-Mar08-STs-IaS-RIOA
M076	Not having a chance to work through the problem ahead of time, I felt rushed and felt my explanation was a bit scattered. I realized this half way through the problem and felt flustered myself. In another class, I wrote out a solution, and tried to emphasize / organize the solution in a little more logically sequenced manner.	I-Mar08-STs-PI-RIOA
M077	Class management - expectations and holding students to those expectations. Knowing what's best for the student and pushing them to that. Aids to help students / teachers know the expectations. Answer the question "What's best for the students?", knowledge, behavior, attitude. meeting the needs (not the wants) of the students. setting a good example. holding students to expectations!!!	FWJE-Jan-Apr08-STs-CM-C
M078	How do I know students are acquiring the knowledge? Assessment - linking assessment to objectives / outcomes, creating assessments alongside lessons, fair assessment linked to lessons, different forms / kinds of assessments - quizzes, tests, journals, etc, projects.	FWJE-Jan-Apr08-STs-IaS-C
M079	On any given day a teacher must consider their lesson... what are students learning? How can they demonstrate they have gained the knowledge? Expectations, delivery why are they learning the content? How does this day fit into this week? Month? Year?	FWJE-Jan-Apr08-STs-IaS-C
M080	A concept map might help the students see the connections between these concepts, and would really provide a foundation to build upon when going through more advanced topics.	FWJE-Jan-Apr08-STs-PCK-D
M081	Keep students involved by having them work through plans.	FWJE-Jan-Apr08-STs-PCK-D
M082	Might work better to have a demo journal handout with all questions. Ask for predictions! How is this different from other scenarios. Can you think of other examples	FWJE-Jan-Apr08-STs-PCK-D
M083	The students should work through this and the teacher can model / explain the answer, and then go right into the lecture notes. If this is done in the comp books, the students can go right into the notes with virtually no transition time.	FWJE-Jan-Apr08-STs-PI-D
M084	Demo - explain the demo, script questions. I have questions scripted on PowerPoint, have a better idea of where I want to go.	FWJE-Jan-Apr08-STs-PD-P
M085	Timing and pace - meeting the needs of students. pacing based on student understanding. feedback - constant assessment. Staying on top of grading, every day.	FWJE-Jan-Apr08-STs-KS/LD-P
M086	Controlling class - demand their attention. I say "so" a lot. Work on public speaking skills.	FWJE-Jan-Apr08-STs-CM-P
M087	Almost one month has passed since my last journal, and with 3 weeks of teaching I have a lot to write on: classroom management (accountability and expectations, leading the class, directing and controlling), unit planning and objective based lessons - teaching to objectives. Smart objectives (specific, measurable, attainable, realistic, testable), Math teaching - giving meaning to the mundane, students as people (going on in life, checking in), grading - staying on top, strategies to help workload. Class plan - lessons, homework, quizzes, tests, and specific units. Helping students succeed - earning an A. Student centered learning. Time management and organization (developing a system). developing a curriculum, beginning to end (textbooks, extras, unit breakdowns, strategies). Revisiting my learning and education - How are / were the issues I'm facing addressed in university education courses, recommendations to others). Makeup work. If I were getting a student teacher I would.....	FWJE-Jan-Apr08-STs-AE/C-P
M088	Check lists - daily activities checklists (attendance, grading, prep, etc.), lesson plan (hitting all the elements of an effective lesson), writing up assessments (tests, quizzes).	FWJE-Jan-Apr08-STs-PI-P

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M089	Developing a system of staying on top of grading that accounts for absences, retakes, daily practice. Ideas - filing system (missing work, today's work, late work, redo's), gradebook, highlighting, must stay on top of grading - daily routine.	FWJE-Jan-Apr08-STS-PI-P
M090	Grade book - hard copy, online version, excel spreadsheet.	FWJE-Jan-Apr08-STS-PI-P
M091	I think this is the toughest part is thinking and preparing for as much as you can. I guess it becomes habit as you do it more often, but it's hard to remember sometimes to include example problems, all definitions, think about what they already know, etc.	FWJE-Jan-Apr08-STS-PI-P
M092	Knowing all components of a unit ahead of time. - assessment, questions, expectations. Knowing these ahead of time allows teacher to tailor lectures to objectives.	FWJE-Jan-Apr08-STS-PI-P
M093	Questions - sidetracked by district testing questions.	FWJE-Jan-Apr08-STS-AE/C-RIOA
M094	I don't think you really have any idea when you start out what all is necessary to start running a classroom, you don't know. Taking attendance every day, making sure your grades are in, collecting homework every day, making sure, all the multitude of things you have to think about.	I-Apr08-STS-AE/C-P
M095	Having that attitude about my own student teaching, like I know when I didn't do well, I know oh, this isn't so hot, I know I had a hard time keeping the students reigned in and on task today. At the end of the day I feel like that's who I've got to answer to, myself. Some days I'm just going to be that way.	I-Apr08-STS-IaS-P
M096	I need, my instruction is better when I am part of a, when I have a plan, when I'm not just throwing it out there and saying well we're going to learn about whatever today,	I-Apr08-STS-PI-P
M097	That's something else that I find so frustrating about educators. You're right, it is very personal. I remember going to this meeting, it was just a professional development group. I'm not really sure, I went to one meeting and Cathy didn't really, it was something that she had signed up to do. And anyway, long story short, they talked about warm and cool feedback.	I-Apr08-STS-InS-RIOA
M098	Where I felt like there wasn't a lot of support in lesson planning and Cathy wrote to me once, you're always seeking feedback, because I would. Once a week I would go and say, what did you see this week? What can I do better? What do I need to work on? Because I felt like they weren't volunteering it.	I-Apr08-STS-IaS-RIOA
M099	Yeah, it's kind of coincident that it came up, but I was looking on line and making my power points, I always do a little bit of background research. It's funny, even though I don't do the writing out, everything that Baker likes, science content, then standards. I always try to do that when I'm planning like a power point or writing up lecture notes for the next section or something new because I figure I've got to get myself organized, I'm going to do a little review. And I came to this hyper-physics, which is a site I've seen in the past, it's like this basically like global concept map of everything physics.	I-Apr08-STS-PI-RIOA
M100	Roberts used to play physics charades and it was goofy and I was like there's no way I would get up in front of somebody	I-Apr08-STS-InS-T
Sa01	Unit 1 was a good way for me to see how other people incorporate real life stuff into their classrooms and what kind of teaching methods they use that best help the students learn.	I-Feb08-MS-RWA-D
Sa02	And you could overlay one on the other and actually see that the catalyst has a lower activation energy but you are still getting the same thing out of it.	I-Feb08-MS-C/SA-D
Sa03	And also the journal article that I read was talking about some kind of visual aid book for a lab so the students can actually see what's going on so their questions are more directed to understanding the theoretical part of the lab and what you're supposed to get out of it instead of asking questions about how do we do this lab and not really knowing what the lab is about.	I-Feb08-MS-C/SA-D
Sa04	Yes, that's kind of what I'm going to be doing the whole semester is if I do have an assignment, try and find a way to incorporate it into the classroom. So use that as a way, a little learning tool.	I-Feb08-MS-AE/C-D
Sa05	Find one place on the balloon to measure the circumference and mark that place so it's the same place that you measure later. Then definitely had different things to measure with, those didn't seem to work out.	I-Feb08-MS-PCK-RIOA

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Sa06	No, not really, just slightly, it was about a half a centimeter. So it did shrink enough to where you could notice it on the tape measure. But half a centimeter on one of those strings isn't that much.	I-Feb08-MS-PCK-RIOA
Sa07	I would have incorporated more thermodynamics terminology into the mini-lesson, along with pictures to describe what is happening in the two different beakers.	RS-Feb08-MS-PCK-D
Sa08	The next time I do this demonstration, I will bring in a model kit and show how the molecules interact, as well as draw them on the board.	RS-Feb08-MS-PCK-RIOA
Sa09	We concluded that bread dough and baked bread should have been presented in a pair such as the cookie dough and baked cookie.	RS-Feb08-MS-PCK-RIOA
Sa10	If I were to do this in a classroom the graphs would be another visual representation of what is actually happening. With one it takes a long, long time for this reaction to happen and in the end energy is still going to be released.	I-Feb08-MS-PCK-C
Sa11	I want to make it interesting so they want to be there and want to learn.	I-Feb08-MS-RWA-C
Sa12	I think using something else as a catalyst instead of the yeast. Because you don't actually see; you put the yeast in as the little granules and it doesn't exactly come out as the little granules. It kind of looks like a solution when it's all mixed in. But I think using something else as a catalyst, like even heat, would probably be better for a gen chem one class in high school where they can see actually what goes in comes out in the same form.	I-Feb08-MS-PCK-D
Sa13	So they'll actually see what happens and understand why it happens and what the purpose of it is. And the same with like batteries and stuff we can talk about it using thermodynamics, but what does that really mean to them.	I-Mar08-MS-RWA-D
Sa14	I think walking into that classroom every day with what you're going to teach. Because if there's a question you can't answer it's not every ones going to be like that. Maybe one here or there	I-Mar08-MS-C/SA-D
Sa15	I think I'll be fairly stern, but also relaxed enough to where the students feel they can come up and talk to me because you wouldn't be a very good teacher if your students were afraid of you. But I think I'll be, I don't know. I don't want them to be goofing off in class or not paying attention, so I want to make it interesting so they want to be there and they want to learn. But I think for the most part half relaxed, half stern.	I-Mar08-MS-InS-P
Sa16	I liked looking at the magazines and the journal articles and seeing what other people are doing in their classrooms and it's definitely something that I never would have imagined in a couple of the articles that I read	I-Mar08-MS-PCK-RIOA
Sa17	I think with this one...this one I didn't do sample calculations on...just for the fact that we didn't do them on the board and they would have something to refer to. I think some of them need that extra...because they know what they're going to be looking for...	RS-Mar08-MS-PCK-C
Sa18	And with this part too it was so hard for me not to say "no, do it this way!"	RS-Mar08-MS-C/I-RIOA
Sa19	The way they did it and the way I would have done it, completely different...I mean there's more than one way to do stuff but...	RS-Mar08-MS-C/I-RIOA
Sa20	I was also trying to...questions here too but then again I didn't want to interrupt anybody doing the activity, I think this was probably the hardest part.	RS-Mar08-MS-C/I-RIOA
Sa21	The ending of the [taught] lab became questionable.	RS-Mar08-MS-IaS-RIOA
Sa22	And if they have more questions based on it, having that knowledge from the day before, having looked it up, and being able to answer those questions will make you not look like that teacher that doesn't know what they're talking about	I-Mar08-MS-AE/C-C
Sa23	In my student teaching, I will use many inquiry based activities to keep students interested in the material at hand.	SJR-Feb-Apr08-MS-C/I-D
Sa24	The only way you will know what works for you is trial and error, and you should not be afraid to try new things. If something fails, then don't use that method again. Everyone is different and will have their own effective way of teaching.	SJR-Feb-Apr08-MS-AE/C-P
Sa25	I will always have a backup plan in place. This is for use if a lesson is shorter than planned, or something within the lesson does not work, such as technology.	SJR-Feb-Apr08-MS-PI-P

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Sa26	Both cooperating teacher s have kind of the same policy on discipline. Both teachers have seating charts, with the "troublemakers" all sitting in the front of the classroom. This was done so the teacher could keep a closer eye on them and so they would hopefully pay attention better. Both of the teachers said they would let the students sit where they liked for the first couple of weeks of the class and after observing them for a while, they would make a seating arrangement so disruptions in the class were limited. I think this is a great idea and may have to try it out in my classroom.	SJR-Feb-Apr08-MS-CM-T
Sa27	The teacher seemed to have a fairly good grasp on time management and the students seem to benefit from her style. The students have plenty of time for getting help with their individual questions and the class also has plenty of time to clear up any misconceptions. Class time seems to be very well managed and benefits both the students and the class as a whole.	SJR-Feb-Apr08-MS-AE/C-T
Sa28	Teaching is more than giving people information. Learning is more than just reading a book and trying to remember something. [From watching him teach], my dad showed me that learning could be fun, and if you are the right kind of teacher, learning anything was possible.	SJR-Feb-Apr08-MS-IaS-T
Sa29	I think with doing this and trying to piece little things together and try and put them in it will make a little bit easier for me when I do have to go out there and make up my own lesson plans every day.	I-Apr08-MS-PI-D
Sa30	I think it helps with, oh yeah, this is the part we were talking about. I can see it in the video and I can reflect back on what we had said about a certain part, like the activity being at the beginning of the class. Which, watching this, I'm like yeah, if we did it that way this would happen, but also this could happen. So I think of the plusses and the minuses about everything that we said when I watch the video. To see if there are things that I would change; some things I would and some things I wouldn't.	I-Apr08-MS-IaS-C
Sa31	And that's another thing, there's lots of calculations in chemistry too, and I think some of them have to be less inquiry...and understand it and once you get towards the end you can do more inquiry because they'll kind of have a sense of what they're supposed to do, what they're supposed to get.	I-Apr08-MS-PCK-D
Sa32	That kind of scares me, I don't want my students to think that I'm not prepared to walk into that classroom and teach them. And not knowing the answer to a question, that's kind of scary.	I-May08-MS-C/SA-P
Sa33	Just thinking about what the person is trying to say and how they are trying to portray it and what I'm getting out of it. So it's kind of like I had to think in a different way to understand what they're trying to say, just to understand it and be able to comprehend it.	I-May08-MS-KS/LD-P
Sa34	A little bit, but it was kind of confusing. I'd worked on it for a couple days but it took me a while to understand exactly what was happening but I finally got it. It's kind of hard to explain and I really don't think that would be a good one to use in a freshman chemistry class or a general chemistry one class	I-May08-MS-C/SA-RIOA
Sa35	I think it was fairly interactive, overall and everybody was participating. I think it could be done just breaking the class into small groups and just doing individual ones and having everybody run to the board and write their stuff on the board. I think it's a good way to get students thinking and if somebody's doesn't work and somebody's does maybe what the do different between them	I-May08-MS-Pd-RIOA
Sa36	I think the next time this lesson is taught, I will have the students actually heat the magnesium to see for themselves that the reaction actually does take place and the law of constant composition actually does exist.	RS-May08-MS-PCK-D
Sa37	I also think that the lesson could be more inquiry based.	RS-May08-MS-C/I-D
Sa38	The one thing I did struggle with was the inquiry part of the lesson. I felt that it was really hard to make this lesson inquiry based and I could have done so more with activity or perhaps a different activity.	RS-May08-MS-C/I-D
Sa39	I think that minor changes [in the taught lesson] will help increase student participation and understanding.	I-May08-MS-Pd-D
Sa40	They did the first couple without the lids and the next couple with the lids, would just throw off their information. I guess I could have let them figure that out but I didn't know how much time it was going to take. So there was one question in there that kind of guided them toward...can't do it that way.	RS-May08-MS-PCK-RIOA

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Sa41	This lesson went smoothly overall and I would feel comfortable doing this lesson again.	RS-May08-MS-IaS-RIOA
Sa42	Oh, very, very different teaching styles. And it seems like Mrs. Donaldson has the upper half class kids where they can sit here and they can pay attention and they will study, they will do their homework. Whereas next door, like she has the bottom half where you really have to stay on top of them, they don't turn their homework in, you can't really get mad and scream and yell. The kids for one, their teaching style is completely different.	I-Sept08-STS-KS/LD-D
Sa43	One thing I've learned is that you have to take a different approach with every class is different and every class has a different personality. And it's kind of, I don't know how to say it, it's kind of nice to have to switch gears a little bit with how you have to treat the classes, to kind of mix things up a little bit. But pretty much the main thing I've learned is you can't teach every class the same way.	I-Sept08-STS-KS/LD-D
Sa44	Mrs. Donaldson also completed an evaluation of me. This was helpful cause now I know one thing I need to work on, teacher questions and student response. Hopefully this can be practiced in the next couple of days.	FWJE-Sept-Dec08-STS-IaS-C
Sa45	If I were teaching the class, I would not put that much emphasis on graphing. It seems like a waste of time and the students seem to get frustrated.	FWJE-Sept-Dec08-STS-PCK-D
Sa46	It is very frustrating to have students who don't seem to care. All they want to do is blow things up, which they will never do. I think more interesting material needs to be found or more activities.	FWJE-Sept-Dec08-STS-RWA-D
Sa47	The fourth period class pays attention, but does not participate very much. Their scores reflect they are learning, but I need to find a way for them to participate in class.	FWJE-Sept-Dec08-STS-Pd-D
Sa48	I am going to dramatically change my teaching style to something that is more comfortable for me and fun for them. I have many ideas in mind.	FWJE-Sept-Dec08-STS-InS-D
Sa49	It seems like students pay more attention when they are interested in what is going on. I think lots of interactive activities should be done in the classroom to promote student involvement.	FWJE-Sept-Dec08-STS-KS/LD-D
Sa50	Sometimes I get the feeling that they are interested in the material and they respect me. Other times I get the feeling that they don't care. I think I need to make it more fun and interesting.	FWJE-Sept-Dec08-STS-KS/LD-D
Sa51	The third period, class was ok but I'm still not getting their full attention. I think I'm giving them too much credit. I treat them as if they are adults and know when to pay attention and take notes, when that is not the case. I think the kids are smarter than they are.	FWJE-Sept-Dec08-STS-KS/LD-P
Sa52	The one thing that still bothers me is the lack of organization at the administrative level.	FWJE-Sept-Dec08-STS-AE/C-P
Sa53	I am getting very sick of sitting here doing nothing. Well I feel like I'm doing nothing. I will be happy next week when I finally start teaching for Miss Donaldson.	FWJE-Sept-Dec08-STS-AE/C-P
Sa54	I am given the material that is supposed to be covered and told the method of presentation. This is fine with me. I take it home and prepare for the next day. However when I got here this morning, I was given a written paper with notes to cover on the board. This is hard for me to have an hour to prepare, but I guess if technology fails in my classroom I will have the skills to prepare for something else quickly.	FWJE-Sept-Dec08-STS-AE/C-P
Sa55	I didn't realize how exhausting teaching can be.	FWJE-Sept-Dec08-STS-AE/C-P
Sa56	It makes it hard on me cause I don't know if they are learning.	FWJE-Sept-Dec08-STS-IaS-P
Sa57	How to light a fart demo! This was fun for everyone. Temperature and volume and density were covered first, then gas (methane) was bubbled through a solution of soap and the bubbles were then lit on fire. The students really enjoyed this demo. It showed difference in the densities of gasses.	FWJE-Sept-Dec08-STS-PCK-RIOA
Sa58	Today we went into the computer lab and graphed volume v temp ©. This graph was used to talk about the K scale. The intro was talking about how temp. affects the volume of a gas. The students were happy with the computer graphing and can now use it instead of paper and pencil.	FWJE-Sept-Dec08-STS-PCK-RIOA

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Sa59	In this lab, students were given a metal sample and asked to determine if the metal was true gold or silver. Density will not be introduced till next week. This was done as an inquiry to density.	FWJE-Sept-Dec08-STs-C/I-RIOA
Sa60	This was the first pep-assembly of the year. Everyone wore purple and white to support their school. It was pretty fun.	FWJE-Sept-Dec08-STs-KS/LD-RIOA
Sa61	3rd period with Mrs. Farmer's class is still very disruptive and disrespectful. Tomorrow some students may be getting written up.	FWJE-Sept-Dec08-STs-CM-RIOA
Sa62	The one class got chewed out today because they won't shut up.	FWJE-Sept-Dec08-STs-CM-RIOA
Sa63	The students were given a mock example for the lab so they would know how to complete the lab. They filled out their lab reports with the fake info. I tried to hold their hand through the lab, but still failed. I think I should have majored in elementary education, just so I would have the right mindset to teach these students that are in high school.	FWJE-Sept-Dec08-STs-CM-RIOA
Sa64	Today in 3rd period, the class got the hint that I'm not going to put up with their crap. I switched up the seating chart and made myself very clear to the class. I emphasized that I was their teacher, and my job is to teach them. And also that they are adults and that's the way I am going to treat them.	FWJE-Sept-Dec08-STs-CM-RIOA
Sa65	The students also found the activity very helpful. They were able to grasp the concept of the measuring tools and how to properly read them.	FWJE-Sept-Dec08-STs-IaS-RIOA
Sa66	Today was a very relaxed day. The students worked on a review sheet and finished their sand lab. Mrs. Donaldson and myself were available for any questions. The rest of the time was spent preparing materials for other classes and future assignments.	FWJE-Sept-Dec08-STs-PI-RIOA
Sa67	Seeing if they understood the difference between just having one atom as compared to having two. Like he said "well it's like hydrogen gas because it exists as H ₂ so you have 2 hydrogens put together." And it's still an element, because it's all hydrogen. So it was me trying to get out of him that he understood why this was an element.	I-Nov08-STs-C/I-C
Sa68	Sometimes I let it go by just because I really don't want to get involved with it, that whole conversation. And other times I will comment on it. So it kind of depends on what they say.	I-Nov08-STs-AE/C-C
Sa69	And it really helps me too because I see it from somebody else's point of view, somebody that doesn't really have a good chemistry background say "well you know, they're probably going to need to know it because what if they go in to this field, or what if they do this?" So my Dad really helps me with the whole reflecting and the teachers and my journal, which you know when I write it is pretty much like _____ for me when I write my journal, no I'm not going to reflect back on it.	I-Nov08-STs-IaS-C
Sa70	But once I have to repeat something about five or six times, then I start getting frustrated and I get crabby.	I-Nov08-STs-IaS-C
Sa71	But yeah, I think just talking to other people and even today after first period I said, you know I did this and this and I really think I need to switch this,	I-Nov08-STs-IaS-C
Sa72	Giving them their homework for the next day. I don't know, I seemed really comfortable in front of that class, which is really weird because this is the first time that I've ever been up in front of them, actually teaching them. So that really surprised me, I was thinking that this morning when I got up in front of them. But I need to be more clear with instructions, I think.	I-Nov08-STs-IaS-C
Sa73	They all got the basic idea of what an element was and what a compound was just by looking at these. They could see that elements, they're different and a compound is composed of one or more elements, but they're all the same. They all have the red, purple and yellow in there with the green bonds. But I still think doing it the way we did fourth, fifth and sixth is a lot better when you come back to it at the end.	I-Nov08-STs-IaS-C
Sa74	Well, did we just write the symbols on them?, and every class asks that. In some classes I said it and some I didn't. So knowing exactly what I need to say along with being more complete.	I-Nov08-STs-PI-C

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Sa75	Well they probably really don't want to learn about elements" but they're going to have to know it so they can do this, and this and this. If they ever do come up here to my class they've got to know what's in the catalytic converter or whatever it's called and the function of each thing is.	I-Nov08-STS-RWA-D
Sa76	I don't think organize is in my vocabulary. (Laughing) It's in about twelve different binders spread across my room. But it seems like I'm a huge procrastinator so the week that the supervisor is coming I'll starting putting everything together and get my two weeks of journal entries caught up for. So I really wait to the last minute, but that's only with stuff that I don't really want to do.	I-Nov08-STS-PI-P
Sa77	State and national standards - It gets into the whole, it's kind of gearing us towards sub-atomic particles and protons, neutrons, electrons and their functions and understanding how chemicals behave if we were to mix them. And, what one is that, like two or three, I don't know.	I-Nov08-STS-C/S-C
Sa78	I really don't know. I know he'd probably say that he has a lot of distractions in the class, which he does. He is one of those people that easily, easily distracted and a couple other people in the class kind of egg him on but once you even whisper their name, they stop right away.	I-Nov08-STS-IaS-C
Sa79	I would look back at their scores and see what they turned in and what they're missing. So see how much effort they put forth and see how many times they were absent and what material they missed and see if that relates to the stuff that they missed on the test at all.	I-Nov08-STS-IaS-C
Sa80	That's a good question. Well one says that I'm a pretty good teacher and the other one, not so much. But I don't know if it's the way they learn, if I'm not implementing enough different learning styles, maybe need more demos, more time in the labs, so visual people can actually see it instead of just hear it.	I-Nov08-STS-IaS-C
Sa81	Yeah, or he's more diverse in ways he can learn. He's really not, because we did a lot of hands on stuff and we were in the lab a lot. We got to see things and then we talked about it, we talked about how they changed. And they had plenty of work sheets, plenty of review, so they got the material more than once.	I-Nov08-STS-IaS-C
Sa82	It's really hard to teach, I don't know, density it was kind of easy because we could write it on the board, we could do it different ways. We could take them into the lab have them find the mass, have them find the volume, but that's something that I'm still kind of working on and how to accommodate for all those different people. And it seems like some of them, no learning style is going to work for them and they should really not be in a chemistry classroom.	I-Nov08-STS-PCK-D
Sa83	And that was kind of the point of that connects activity that we did too. Having them see that, well there's three different colors in there but they're all connected. So they're all one and there's four of them inside that bag. But some people still thought it was a mixture because there were different colors, and some people said, oh no, no, no, got to be pure substance because they're all connected, then they're all the same. So, just them seeing that, "oh, well, now that I know what a pure substance is, this wouldn't be a pure substance, it must be a mixture", and saying the same thing, that's not a mixture, that's a pure substance. So, where they go wrong for themselves, I think that's really big because I know when I did it in school that I learned and said "oh, hey, that's where I went wrong, and I need to do this, and this is the right way, or this is the right definition of something".	I-Nov08-STS-PCK-D
Sa84	Well it also gets them to the history, which I know is five or six, where things come from, how we come up with this, why we can teach it in the classroom instead of 'oh, some dead white guy said this 2000 years ago', so there you have it. Knowing that everything around is made up of some form of matter. And then when we get into the lab and the different instruments we use in the lab, and precision and accuracy and the difference between them. How that relates to real world and all of that stuff. So not only just the material we're covering but the history and how to operate equipment in the lab, that all goes towards standards.	I-Nov08-STS-C/S-D
Sa85	Mrs. Donaldson's classes aren't that diverse. I mean you have your occasional one or two that doesn't get the material. And they'll come in before school or after school and they'll get extra help. Or if you're working on a work sheet, they'll say "you know I didn't really understand this, can you please help me?"	I-Nov08-STS-KS/LD-D

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Sa86	Yeah, okay. I think that every student has a different way of learning and today I ran into a problem with a student where I wasn't giving him enough time _____ he was getting frustrated. So I talked to him after class and we figured out something that would work that I could do to help him so he wouldn't become as frustrated in class. But I think I walked into something that I knew was going to be piece of cake, just because I knew the material, but that's not the case. You have to teach to the whole class as well as to every kid. So you have to make sure that everybody gets the general idea of what you are teaching but in a way that's beneficial to them so that they'll remember it. And it's a lot harder than it sounds.	I-Nov08-STs-SR-D
Sa87	I don't know what else to do but start sending people to the office.	I-Nov08-STs-CM-P
Sa88	And then when I did ask them at the end of class, 'well which ones are compounds now, which ones are mixtures, which ones are elements?', they all came up with the same answers.	I-Nov08-STs-IaS-RIOA
St01	When looking at the videos of my teaching methods during the demos I presented, I learned so much about myself and found characteristics that I would want to change.	RS-Feb08-MS-IaS-C
St02	And even when it gets to student teaching, you can work on it, it doesn't mean that it has to change right away. I think it's more of a progression. You know, you start more structured, and if you see what works better, you can learn how to change with it.	I-Apr08-MS-AE/C-P
St03	Creating ways to have differential classroom instruction is crucial in becoming a great teacher.	RS-Apr08-MS-Pd-C
St04	Developing this unit has helped me gain understanding of the importance of having structure and professionalism when planning lessons.	RS-Apr08-MS-PI-P
St05	Finding different ways to compliment individual needs and characteristics would be a goal of mine throughout my labs and lessons.	RS-Apr08-MS-KS/LD-D
St06	I believe I created an innovative and inquiry based unit that will help students gain knowledge and value the importance of why and how the cell cycle and mitosis occurs.	RS-Apr08-MS-C/I-D
St07	I believe respect and trust are two of the most important values needed in a classroom in order for learning to occur. These should be mutual between both the teacher and the students and should be established at the beginning of each year.	SRJ-Feb-Apr08-MS-InS-P
St08	I believe students are amazing creatures striving to learn and are willing to go above and beyond what is expected. Students just need help getting started and as a teacher, I will be there to guide students along their way.	SRJ-Feb-Apr08-MS-KS/LD-C
St09	I definitely think that I would just focus on one topic of the muscle because time was definitely an issue.	RS-Feb08-MS-PI-D
St10	I do want to say that I have learned so much from this experience. It was kind of a challenge to begin with but there is a lot more going on at that school than I first knew. I will definitely take this experience into my future teaching! Thank you all for listening to my experiences.	SRJ-Feb-Apr08-MS-SR-C
St11	I have also taken a lot of time to reflect on my work.	RS-Apr08-MS-IaS-RIOA
St12	I have learned a great deal from Lauren about adjusting to different environments, motivating students, and creating a more relaxed type of structure that compliments the students needs and characteristics.	SRJ-Feb-Apr08-MS-SR-D
St13	I have learned that there are so many factors and alternative approaches needed for a unit in order to compliment all students' needs, so it took a lot of time and thought to complete this unit.	RS-Apr08-MS-KS/LD-D
St14	I have seen a big change in some students attitudes since I started here a couple months ago. The other day, two senior students called an assembly for the whole school. They had conducted a survey on respect in the school. They told students that something needed to change and it is a privilege to go to Bridger! I think this really touched the teachers and students!	SRJ-Feb-Apr08-MS-SR-C

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St15	I learned a lot of new qualities about how I present demos, things that I would have done differently, and strategies to try for further lessons. I thought it was a great way to visualize how to teach and make changes here and there to improve the demo and make it more comfortable for both the teacher and the students. I really enjoyed this unit and am looking forward to making more demos in the future!	SE-May08-MS-PCK-D
St16	I learned about teaching inquiry labs, and making them fun and interesting for the students.	SRJ-Feb-Apr08-MS-C/I-RIOA
St17	I learned how to manage time.	SRJ-Feb-Apr08-MS-PI-RIOA
St18	I need to change it [my work] to become more applicable to every students' needs.	RS-Feb08-MS-KS/LD-D
St19	I think Lauren does 20 point quizzes instead of test because of the nature of her students. They don't like the idea of traditional teacher's giving major tests were their whole grade depends on passing it. Lisa has found different ways to assess her students' learning that works for the type of students in her classroom. It really compliments their needs!	SRJ-Feb-Apr08-MS-SR-T
St20	I think Lauren does a good job getting her students to begin a new task. I will definitely try some strategies that I see in her classroom!	SRJ-Feb-Apr08-MS-SR-T
St21	I think that Lauren has helped me develop more understanding on how to get respect from students and developing different teaching strategies so the students are motivated and can learn to their best ability.	SRJ-Feb-Apr08-MS-SR-T
St22	I will also use a variety of teaching styles to accommodate for the variety of learning styles in the class.	SRJ-Feb-Apr08-MS-KS/LD-C
St23	It was interesting to see different personalities, ideas, and strategies come together to form one tree [in the lesson]. I think it was a good example of how group activities could be carried out in a classroom.	RS-Mar08-MS-Pd-RIOA
St24	Lauren also has shown me how to be flexible with lesson plans, have less structured class, and create different learning experiences for different students.	SRJ-Feb-Apr08-MS-SR-C
St25	One observation that really interested me is to see how the teacher motivated the students to work, listen, and carry out group activities. The teacher would offer bonus points for people to hypothesize or predict the correct answer or outcome. Another strategy used was to allow students to come in after class and have a mini-lesson to make up any missed work or point on work that received poor grades. Many students actually took advantage of these options and participated in the activities.	SRJ-Feb-Apr08-MS-PCK-T
St26	Other motivation strategies used by the teacher were to relate the lesson about circuits and light bulbs to their everyday lives by making visual aids of different circumstances in life to see which would have more or less resistance, power, or current. The students seemed to pay attention more when she showed the visual aids and related them to the students' lives.	SRJ-Feb-Apr08-MS-RWA-T
St27	Overall I learned a lot from the students and the teacher [in this unique setting of an alternative school] and am excited to continue this in the coming months.	SRJ-Feb-Apr08-MS-SR-P
St28	Probably my biggest weakness would be, learning how to adjust when something goes wrong, or when something doesn't go how you planned it, I'd want to learn different ways to adjust to it.	I-Mar08-MS-AE/C-P
St29	So I guess, time management would probably also be something [to improve upon], because although it is structured, you have to know how much time you have, and you have to leave in time for other stuff going on - I learned that, too.	I-May08-MS-AE/C-P
St30	So, by being there I've learned, like, you're going to have students, like the ones I see every day, and you'll need to learn how to, I've learned different ways to accommodate to them. And still make sure they learn.	I-May08-MS-SR-T
St31	Students need a variety of teaching methods to keep them focused and entertained	SRJ-Feb-Apr08-MS-SR-T
St32	The students in one class had a test last Thursday. When the test was handed out, a couple of students talked to the teacher and gained permission to take the test the next day. When I asked my cooperation teacher why the students were allowed to do that, she told me that the students were on an IEP, meaning they have special accommodations that need to be met.	SRJ-Feb-Apr08-MS-SR-C
St33	Time and limiting the demo to one idea are the two main strategies I would like to work on and improve to make my demos more efficient and structured.	RS-Feb08-MS-AE/C-P

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St34	Your kids are all different, you can't, you can only do so much to teach them like if they're not going to turn in stuff and you ask them and you do as much as you can, that's all you can do.	I-Sept08-STs-PI-P
St35	I get to learn like the different kids who, their strengths, weaknesses and practice different types of like attention strategies or planning strategies.	I-Sept08-STs-KS/LD-P
St36	I have beliefs in making sure that there's not one type of assessment. I do some application, some content, just to make sure the kids are showing all their different skills.	I-Sept08-STs-KS/LD-P
St37	I've had to find a way to deal with 30 kids and find ways to, I guess to keep the kids on track that are misbehaving and not like making that stop my planning.	I-Sept08-STs-AE/C-P
St38	So I just had to get to know the students and by getting to know the students I make assignments that like go to their needs.	I-Sept08-STs-KS/LD-RIOA
St39	The science department is really cooperative, we plan together, we have meetings once or twice a week and we plan what topics we want to teach that day and we try to stay on the same page.	I-Sept08-STs-PI-RIOA
St40	I gave a pre-assessment to the students to see how much they already know about the cell. Some answers were correct while others need help. It definitely helped me know what should be the major focuses on the Unit.	FWJE-Sept-Nov08-STs-IaS-C
St41	This movie was a great lesson because it showed a habitat with many different species' interactions, different types of adaptations, and different r-adapted and k-adapted species. I think it helped students understand what ecology was and how it relates to their everyday lives.	FWJE-Sept-Nov08-STs-PCK-D
St42	In physical science I have some students struggling academically. Day after day they either don't hand in homework assignments or struggle to get the right answers on tests and quizzes. I am going to sit down with these students and talk to them. We need to find out how we can work together to help these students improve their grades. I hope that they will be willing to set goals and plans to improve their grade and work ethic. If this does not help I am thinking about having a meeting with the students and their parents to discuss their academic situations.	FWJE-Sept-Nov08-STs-SR-D
St43	This week I also had to call parents about students who had F's in my classes. I was definitely an experience. Some parents were surprised, others were knowledgeable about their child's grade, and some were just phone messages. After calling one parent, that student came directly into my office and got the 11 missing assignments. I guess I will see if that has a direct effect on his progress and grade.	FWJE-Sept-Nov08-STs-SR-D
St44	I also found that although students appear to understand the content you are teaching, there are some who are struggling but won't ask you questions.	FWJE-Sept-Nov08-STs-IaS-P
St45	I also feel that the students are comfortable with me. Everyday more students ask questions or come for help when they don't understand something. I definitely think a trust and respect feeling has been developed between the students and myself!	FWJE-Sept-Nov08-STs-PI-P
St46	I am very comfortable in my classes and feel like I am getting to know my individual students pretty well. I have noticed those who are struggling academically but are truly trying, those who don't turn in assignments, those who are excelling, and those who need an extra push along the way.	FWJE-Sept-Nov08-STs-KS/LD-P
St47	I have almost learned all the biology students' names and have a feeling of where each of them are academically in biology. I recognize those students that are struggling, those who are excelling, and those who just don't turn in their homework.	FWJE-Sept-Nov08-STs-KS/LD-P
St48	It is harder to get to know the zoology students because we only see them twice a week, but I have recognized most students abilities and characteristics.	FWJE-Sept-Nov08-STs-KS/LD-P
St49	Overall the lessons were very interesting, but what was even more interesting was what I learned from my students. I learned that some students are very bright when it comes to certain aspects like calculating and comprehending knowledge, but can struggle when writing lab reports both in spelling and literacy.	FWJE-Sept-Nov08-STs-KS/LD-P
St50	We have a lot of students that are not handing in their homework as well. These freshman classes have probably taught me the most so far about handling students with behavioral and responsibility issues.	FWJE-Sept-Nov08-STs-KS/LD-P

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St51	This week I have learned the most so far. I have had to deal with students that don't give me or other students any respect. They talk while I am talking, make fun of other students in class, or make rude comments. I have had to pull them aside and talk to them about the problem that is going on.	FWJE-Sept- Nov08-STS-CM-P
St52	I have also had to talk to students who are failing class or missing a lot of assignments. I have given them a chance to get at least half credit to turn in assignments. Some do turn it in late, while others don't do it even after I talk to them. I have learned that there is only so much you can do to make the student hand in their assignments.	FWJE-Sept- Nov08-STS-SR-P
St53	Other important aspects of teaching that I saw this week is the importance of communication between other teachers in your department. I saw different opinions, ideas, and styles between the departments arise during the PLC meeting that will help me in my own teaching. I will know what to expect and find ways to approach these circumstances if I ever come across them.	FWJE-Sept- Nov08-STS-AE/C-P
St54	In Zoology, we introduced the first phylum we are studying by having the students go collect arthropods and identify them.	FWJE-Sept- Nov08-STS-PCK-RIOA
St55	For biology the average on the test was around 83 so the students did pretty well. The short answer questions were not done as well as we would have liked. The students didn't answer the questions completely or accurately. We felt as though not to grade as hard for this test because we didn't spend as much time as we wanted on the different topics. With that being said, we did tell the students to spend more time and effort on the short answers for the next test because we are expecting more thorough answers.	FWJE-Sept- Nov08-STS-RWA-RIOA
St56	For physical science the average was a 73. Students struggled on definitions of mixtures and calculating densities. Some students left answers out completely. Overall for the freshman's first test, they did pretty well.	FWJE-Sept- Nov08-STS-RWA-RIOA
St57	In Physical science, we introduced the scientific method and went over specific guidelines we would cover this year.	FWJE-Sept- Nov08-STS-C/SA-RIOA
St58	Overall the first week ran very smoothly. I was team teaching with Mr. Wilson, instructing labs and activities that work well, and gave notes using powerpoints, overheads, and the white board.	FWJE-Sept- Nov08-STS-IaS-RIOA
St59	do you feel you give them mixed messages? You say "if you're not in your seat, it's a tardy". Then you don't mark them. You engage them, then you talk to them, and then you shush them.	FWJE-Sept- Nov08-STS-CM-RIOA
St60	During presentations I had to talk to a couple of students for not paying attention and being disrespectful to the presenter. One understood the problem, the other was upset. After class I talked to the student and discussed the problem.	FWJE-Sept- Nov08-STS-CM-RIOA
St61	During the test two different students were using their phones while taking their tests. We took the phones away and gave the students half off on their test. These students are either juniors or seniors and should know that they should never use their phone in class let alone during a test. Next time they would get a zero on their test immediately. Hopefully they will learn from the consequences because their grade is definitely going to drop.	FWJE-Sept- Nov08-STS-CM-RIOA
St62	I did have to talk to a student who is a freshman in my physical science class. He is very disruptive, has been taken into the hall, and has had to move seats. He told the teachers that they only pick on him and don't like him. I had to talk to him about how he needs to respect the teacher in class and not talk or be disruptive during class. he finally recognized that the teachers do tell other people to be quiet and that he needs to work on being less distracted and disruptive.	FWJE-Sept- Nov08-STS-CM-RIOA
St63	In Physical science, I have come across more problems with students behaviors. We did a matter phase change lab and some students were not practicing proper lab safety. Other students were throwing things and some left the room to talk on their phones. The next day we had to talk to the class about not giving them any more warnings.	FWJE-Sept- Nov08-STS-CM-RIOA
St64	We did have some problems with a couple students in Zoology. Along with using their phone during the test, we found that some students were copying each others homework or labs exactly. The two assignments had the exact same answers. We had to talk to them and explain why cheating is unacceptable. They acted very rude and did not respect us as teachers.	FWJE-Sept- Nov08-STS-CM-RIOA

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St65	We have students that have a ton of unexcused absences and tardiness. She skipped out on the day of the test and rarely is on time to class. We talked to her and gave her a zero on the test. Today we are calling home and are going to work out a plan or discuss the issue of the tardiness and absences.	FWJE-Sept-Nov08-STs-SR-RIOA
St66	Finally, the assembly on Friday was an hour and a half so I definitely noticed that the students in all of my classes were distracting and putting little effort into class and their assignments.	FWJE-Sept-Nov08-STs-AE/C-RIOA
St67	I have found that the freshman in physical science are struggling more with basic conversions than I had thought so I had to learn to adjust and spend more time on that topic than I first planned.	FWJE-Sept-Nov08-STs-AE/C-RIOA
St68	The activities I have already experienced are a school assembly, PLC meeting, and student Advisory meetings.	FWJE-Sept-Nov08-STs-AE/C-RIOA
St69	Journaling is a good way to do my thoughts. I've done one concept map but I never finished it because I decided for me, for concept maps, it's a good way to do my thought but I liked for me to have more concrete lesson planning so I can see how much time I need to do each one. I think that I would definitely do it for like future, for students to have them do it because it's a good way to have them organize, like what they want to do. like for me as a student in methods, it's good for them to organize their thoughts.	I-Nov08-STs-PCK-D
St70	so for instance, this week our averages were lower on this test than last week so we tried to figure out, you know, is it the wording of the problems? Is it not studying, is it the material is just harder in general?	I-Nov08-STs-RWA-D
St71	There's some students that, you know, need extra time on stuff. There are some students that get distracted easily or distract so I try to move around the class a little bit, give certain students extra time to get it in and they have trouble seeing, of course they have to move to where they can see. We try to talk one on one with the students that are struggling, so we try to do that. just try to make it so they have the best environment to work, the lowest distracted environment and the best way to learn.	I-Nov08-STs-KS/LD-D
St72	I just changed seating, every test we do we try to change it to see if it helps out.	I-Nov08-STs-CM-D
St73	Like if the student's really distracted, not necessarily because he doesn't get it but if someone starts talking or moving or it it's someone that student knows then they can't pay attention to what they're doing. Like I had this student, it was test day and he just was not focused on the test and so we tried to move him to the front, tell him okay you've really got to focus you only have this period to finish this. Then he's like "I don't get it" so I explained the directions to him and he started working on it more and you could see he started getting distracted. So you just have to keep going over to him and telling him, you know, this is important. you kind of have to reinforce it, over and over again.	I-Nov08-STs-CM-D
St74	We have these PLC meetings and we get together as our whole department, we have a biology PLC and then we go over and do a physical science meeting. We do those on Wednesdays, like maybe once or twice a month and we get together and we focus on how they did on their tests, what needs to be changed, essential learnings and try to plan for next time.	I-Nov08-STs-AE/C-D
St75	Each day when I'm doing my journal I talk about what goes right and what goes wrong and things I've experienced and things I've changed for next time. Sometimes I do it with the cooperating teacher and we talk about things we could do differently or things we saw or different strategies to use.	I-Nov08-STs-IaS-D
St76	Strengths - I think it's going really well; I've really go to know the students and I think that's a strength. Which ones need individual help and how the students, what their strengths and weaknesses are. I've worked with individual students and helped them understand stuff and I think I'm pretty organized and plan out each day and each week ahead of time.	I-Nov08-STs-KS/LD-P
St77	Weaknesses would be more like working on figuring out discipline and strategies on different ways to make the class stop talking or if there's a certain student who's way out of line, how to approach that situation. That's always going to be something that you have to learn and progress to find something that works specifically for yourself because every teacher is going to have a different strategy. So I think that's what I'd work on, mostly.	I-Nov08-STs-CM-P

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St78	Knowledge you need for bring a teacher, you need to know your content, you need to know how to have multiple strategies in teaching, you need to know even values in what's right and what's wrong. You need to know professionalism, communication skills, it's like everything put into one because you interact with all those different things. It's not just teaching content.	I-Nov08-STs-IaS-P
St79	Every day I just write down notes kind of what we do every day or if there's any problems with kids or students. And then every day I do a 2 page electronic journal.	I-Nov08-STs-PI-P
St80	I do journals every night before I leave to not get so overwhelmed.	I-Nov08-STs-PI-P
St81	I've been having to, like when we do the science department meetings and we give out what we want to do, I've been having them modify it to explain it in the best way I can. Like they might explain it differently, so I've had to modify it so I feel comfortable teaching it. And I feel comfortable with my students knowing what I teach.	I-Nov08-STs-PCK-RIOA
St82	Umhum. I think because how I gave them an example I think they understood that before I even put on that I wrote out how many protons, neutrons, and electrons so I think for the next period it would reinforce that. It's good to actually figure out how many there is over everything before you actually start drawing it.	I-Nov08-STs-PCK-RIOA
St83	One freshman boy was failing, and he thought I hated him, because I kept moving him. He came in after school and we talked for about an hour, and now he is passing.	I-Nov08-STs-SR-RIOA
St84	There was a popular girl, she didn't come to class or try, she failed the first 2 tests, I took the initiative to talk with her, and she got one of the highest grades on the next test. She said to me "You're the only teacher that cared to help me out".	I-Nov08-STs-SR-RIOA
St85	What didn't work [about the lesson] is the PowerPoint didn't work for one. I think some people had trouble seeing the white board because I had to do it on the white board and it's harder to see when you're farther away. So hopefully next time the power point would work because that's easier to see. The students seemed to understand what was going on, and yeah, I think overall it went pretty good.	I-Nov08-STs-AE/C-RIOA
St86	I prepared by reviewing the PowerPoint, went over the work sheet to make sure I knew what I was doing to make sure I can teach it efficiently to the students. So I reviewed the material, made sure I had the lesson right. I always look back at what we did the day before to make sure if we need to review anything, or like, for instance some of the kids were absent so I had to make sure that they got their turn to do it. So kind of like just planning ahead of time and then doing it. Reviewing materials, writing lesson plans and reflecting on the day before.	I-Nov08-STs-PI-RIOA
St87	We don't necessarily have to teach like the same work sheets or the same PowerPoint's as long as the overall ideas are the same. Then we write our tests together so we give out the same tests.	I-Nov08-STs-PI-RIOA
St88	So we wanted to try a different approach to where, if each student like looked into one and then shared it and presented it and then we'd put it around the room and it would give each student the chance to know the element in a different way than just looking at a periodic table.	I-Nov08-STs-PCK-D
St89	We tried to put everything that's due the next day up on the board in that area. We share rooms so we don't get to have a permanent place, so that corner is sort of our corner. I sometimes have students complain like, "Oh you didn't tell me there's a quiz tomorrow, how would I know. Or I didn't know that was due tomorrow", so they can't say that. they all should have a heads-up, they all should have planners. So as soon as I write something up there they should put it in their planners. That's why I did that.	I-Nov08-STs-IaS-D
St90	And he was doing something, I noticed that all the kids started looking out the window. So I was going to go over there and see what was going on and then I saw the kid run away. So then, it always after it happens, the kids start laughing and then things, I want to make sure 'yeah you got distracted, so let's get back on to the lesson. So that's what happened there.	I-Nov08-STs-CM-RIOA

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St91	Oh, there were kids in the back and someone said something, it was, I can't remember who it was, but someone said something, and then all of the sudden everyone started laughing. So I knew when they do something, you could just tell that something was going on over there. And that group over there has tended to be off topic and distracting to other people, and I think behind my, I think I heard something that was not good about someone else, but I didn't hear for sure so I wasn't going to say anything, But that's just a kind of a way saying there'd better not be anything inappropriate going on over there. I can't hear that before, but now I know what you're talking about.	I-Nov08-STs-CM-RIOA
St92	Ah, it was just, they're, it was kind of an off time because the power point obviously wasn't working on the screen so I was surprised that there wasn't more talking in the back room because I thought that they'd be talking more, but they're actually pretty quiet. So during that time it was just kind of like an off time for a couple minutes.	I-Nov08-STs-AE/C-RIOA
St93	While they're working on their assignment, I'm planning ahead, getting stuff done, getting ready for the quiz tomorrow and since it's not just my room I have to do it then or I don't have time to do it until I go in there again.	I-Nov08-STs-AE/C-RIOA
St94	Oh, don't you love technology. I think because this happened two days before in the same class and we were talking about how sometimes it doesn't work.	I-Nov08-STs-PI-RIOA
St95	I have it written down, I think it's state standard 2 where students need to understand matter and it's nature which includes atoms that make up matter. I kind of summarized that but that's what the standard is.	I-Nov08-STs-C/S-C
St96	The biggest change in my knowledge skills beliefs as a teacher from methods class to now is definitely seeing the whole picture, like in methods you're not there, you're practicing it, you're not seeing the whole picture, you're not seeing the community that you're in, and now like seeing how teaching actually is, how it does take a lot of work, you do have to plan ahead, you do have to have multiple strategies for individual students, you do have to be a cooperating teacher with other teachers. Because there's , it's a standard for Colorado that you have to have common assessments so in order to have common assessments you have to be a good team player within each department. I've definitely seen the big picture and I've definitely learned how to be prepared and plan ahead and how to interact with other teachers. So when you practice you learn a lot more than when you sit around in class and learn it than when you go to do it.	I-Dec08-STs-AE/C-P
St97	In general, 2 sophomore girls always did everything I asked, they let me keep their work as examples, and just provided a happy and fun attitude.	I-Dec08-STs-PI-RIOA

APPENDIX K

RESEARCHER FIELD NOTES FOR ALL PARTICIPANTS

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Methods Semester – Field Notes (Eva)

September 2007: In her senior year of school, Eva enrolled in EDSD466, Methods of Teaching Secondary Science in the fall semester. Eva found the atmosphere in methods class to be very open and relaxed. As part of the class, each student was required to present several lessons to their peers, some of them being videotaped. The students had to watch several videos of their teaching, and to consider that “data” along with peer feedback cards, and to write a reflective summary about their teaching. She admits to being nervous and uncomfortable during her first presentation, but became more comfortable with being in front of her peers as she proceeded throughout the semester. For Eva, the feedback cards made her feel better than how she thought it went. She explained her experience in an interview (November 2007):

That was really helpful, it kind of gave me the confidence booster, like ok this wasn't so bad, so now I can work on these things and a lot of things that I didn't think I needed to work on, they mentioned too, in the cards. At first I was scared to say things that I didn't like or liked about other people's things, but when I saw how they were open about it, it seemed like they were comfortable. It made me more comfortable discussing how I felt.

Eva liked the positive and suggestive peer feedback, and had a respect for her classmates, noticing their level of content knowledge and their ability to be honest with each other.

Of the four major assignments in the methods semester (Appendices 14-17), Eva's first presentation to the class was a demonstration / lecture about density. The

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assignment required methods students to plan and deliver a 20-minute lesson in which they would present a demonstration to their peers, and teach a small amount of content, such as that which would be included in a lecture. She was very nervous during the lesson, as the person before her had also chosen density as their topic. Eva embraced this challenge, and after reflecting on the lesson, she realized that she could have been more organized, have better delivery, and a clearer closing to the lesson.

October 2007: During the second presentation, which was a group lesson that took place a few weeks later, Eva worked with two other students. Together they taught a lesson on ecology. The objective of this assignment was for a group of two or three methods students to teach a thirty-minute lab to other methods students. This lesson resulted in the students in the class (peers) getting very excited and involved in the lesson, and carried away to the extent that they interrupted the lesson, asking questions to the presenters about why the lesson was taught in a certain way, and what they would suggest to do differently, along with compliments towards the lesson. Eva and her group members did not get to finish their lesson before the class broke and started the discussion. Because of this, there were several different reactions of the members in Eva's group. In an interview (October 2007), Eva describes the experience as one of frustration, and ultimately contentment.

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It was just like they [the group members] were so upset and frustrated. And when other people are upset and frustrated I like to help them and understand and like everything I said to them really wasn't helping. So then I just became frustrated with myself that I couldn't make them feel better about it. So I started to think, maybe there was something really wrong with this and I don't understand what that is, you know. Like I did understand but I didn't think it was that big of a deal. So I tried to put myself in Kate's shoes where there's all this stuff that I wanted to say but couldn't say it. But she did get something of it out and she led the discussion fine.

After Eva took some time to think about this situation, she talked to the other group members. She saw that they were less frustrated with how the situation had developed, and it was no longer a worry for them. She came to the conclusion she could grow as a person and learn from this experience. Eva confided, "I think that it was ok that they were frustrated with it, but I decided that I didn't have to be frustrated with it. I can be happy and they can be frustrated. That's ok with me."

December 2007: During Eva's final presentation of the semester, which was a full microteaching lesson, she was more comfortable and relaxed. She felt that she had made significant progress, but there were still areas that she would like to improve.

As a result of the methods class, Eva felt that she had learned about the relevance of content knowledge, skills such as how to prepare for lessons and time management, and dispositions such as how to be more comfortable with herself around her peers. She also learned how to be comfortable even when others were uncomfortable. Eva saw a strong relationship between teaching and learning. In an interview (October 2007), she talks about how learning and teaching was connected:

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I think as a teacher you have to change and grow and that's what this methods class was all about, was to help us become a better teacher and learn what we need to do and what kind of teacher we are. So I think even in the next twenty years of teaching I'll probably still change

Eva realized that there were many changes that had taken place in her evolution as a pre-service teacher. She had become a lot more comfortable in front of the classroom, and it was easier for her to prepare lessons to teach because she knew the method she needed to use, and how to practice teaching.

Eva found that her cooperating teacher in her clinical field experience used inquiry as the foundation of her teaching. In an effort to learn more about this way of teaching, Eva requested that she substitute one of her journaling questions for writing about inquiry teaching and learning. To accomplish this, Eva would interview her cooperating teacher about this model of teaching. As a result, Eva candidly reported in an interview (Dec 2007),

I've learned quite a bit from teachers using inquiry. At first it drove me crazy when she would be questioning the students trying to get them to give the right answer when it was so simple, I think I would have just given in and told them the answer. I've learned to be more patient and realized the importance of inquiry.

The combination of instruction she received in EDSD466 and the practice gained from the clinical field experience allowed Eva to fully experience the results of an inquiry teaching and learning approach.

As a result of the clinical field experience, Eva felt that she had gained experience in teaching and working with the students that would assist her during the next step of her education. She had gained actual experience with learning by inquiry. "I had understood

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it before but did not know how to incorporate it comfortably until my [clinical field experience]”. She had learned that she could connect with students in a short time period, several management techniques such as counting down from 3, turning the lights off, or calling on students who were not paying attention. Eva also found that she loved connecting with the students and having a relationship with the class. In an interview (December 2007), she comments:

It’s because I had such a good time with them [in the clinical field experience] and I want to be a teacher even more. They all seemed to like me and be in awe of me, but still appreciated me for being a teacher and everything. So I really like that.

In thinking about the quickly approaching student teaching semester, Eva felt nervous and excited about the challenge that waited for her. “It will be fun but I’m just nervous that I don’t know everything I need to know.” She looked forward to her student teaching experience, knowing that she would need to work on the timing of her lessons, checking in with her students for understanding, and her classroom management skills.

Student Teaching Semester – Field Notes (Eva)

January 2008: As Eva began her student teaching experience, she adapted quickly to the daily schedule. She began her semester by observing, and gradually began taking over the ninth grade earth science classes. Her cooperating teachers were very supportive, and collaborated to make her experience as productive and successful as possible. She explained their philosophy in an interview (February 2008):

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[My cooperating teachers, Valerie and Rachel], they've never had a student teacher before so they just want to make sure that I'm getting everything I need out of the experience. They're just like really trying to get me in there, do as much as I can and get as much experience as I can, which is good. And their philosophy is that when they student taught and their first year of teaching there was so much stuff that they didn't know and they want to make sure that I know that stuff, so that's cool.

The transparency provided by Eva's cooperating teachers allowed Eva to develop a relationship with them as a community. Eva greatly appreciated understanding their intentions behind what they asked her to do.

March 2008: Eva initially struggled with taking on the 11th grade Chemistry class.

She began teaching, and then became nervous that she didn't have the confidence or content knowledge to do a good job. She informed her cooperating teacher that she wasn't ready to take it on, and that she would not be teaching this class so soon. Her cooperating teacher allowed her to take two days off, but then urged her to continue teaching. In an interview (March 2008) she explains,

Rachel, [my cooperating teacher] wanted me to add another class right away and I'm like, no, I can't. But then she pushed me back into it. She's like I'll give you two days and then I want you back in there. She's like, I know that it's tough and I know that it's stressing you out, but you need, I guess kind of experience that and get your confidence back up and get more experience in Chemistry. And like it was true, I didn't like it, but it was true.

Eva trusted her cooperating teachers, and this bond contributed to a successful student teaching experience. Another thing Valerie and Rachel did to help Eva was that they made their resources available to her, but when she began teaching full time, she was not allowed to look at any of their resources- she had to find them on her own. Once she

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started giving the classes back to the cooperating teachers, she was able to use their resources again. This was done in a good-natured way, and it encouraged Eva to be independent and resourceful when planning lessons. It also made her prioritize what resources were most important.

At first, Eva was intimidated by the prospect of teaching Chemistry. Interestingly enough, as the semester continued, much of Eva's free time was often spent helping Chemistry students who needed more attention. She would eat lunch with them and they would work on their assignments and ask her questions as necessary. Eva grew in her confidence with Chemistry, and also with teaching. She came to several conclusions about her experience with teaching high school. Eva found that she greatly enjoyed the students and teaching the material at the freshman level, but realized that they were more difficult to manage in class. At the other end of the behavioral spectrum, seniors hardly took any classroom management, but Eva didn't enjoy teaching that age nearly as much. In an interview (April 2008), Eva elaborated:

I feel like the younger kids are more fun and interesting. When I did my clinical field experience [during the methods semester] with the 6th grade classroom, I really really enjoyed that age. So I am thinking that when I'm done I will look for a middle school job.

Through working with different age groups, Eva felt as though she had found her niche as an educator.

Towards the end of the teaching period, Eva reflected on her strengths and weaknesses. She felt as though she was a very personable and friendly teacher. She had good relationships with most of her students, and they seemed to respect her. One of the

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other student teachers reported that students had told her that they really liked her class. Eva felt an increase in her confidence after learning this, and it encouraged her confidence even more.

Eva felt that she was confident in her Earth Science content knowledge, especially in the area of volcanology. She makes the connection between real world experience and teaching: “Since I’ve been to Hawaii, hiked on the volcano and seen lava, I get really excited talking about it and I think that excitement will transfer to the students and help them get excited about it too.”

Eva also felt that she used many positive methods of interaction with the students. She congratulated good ideas, questions, and student-initiated study skills, such as tricks on how to remember certain terms. She made simple comments on her students’ homework and tests, such as “good”, “nice job”, or “wonderful”. She added; “I also complement them if they look good or have cute jewelry.” This type of interaction with the students greatly contributed to Eva’s passion for teaching.

April 2008: In conclusion, Eva felt that her weaknesses included classroom management skills, especially with her seventh period class. In an interview (April 2008), she added, laughingly:

I have two pet peeves. First is when the students leave answers blank, especially when they are multiple-choice questions! They could at least narrow it down and guess. My second is when I give class time for work, they get it done, don’t want to turn it and then lose it by the next day!

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In general, Eva felt as though she improved quite a bit in this area, but not to the point where she wanted to be. Also, she felt that she could learn more about the content that she was teaching, especially Chemistry.

Eva completed her student teaching practicum successfully, and after graduation, interviewed for various positions. She accepted a job with Project Wet, as an International Programs Assistant and began developing science curriculum for K-12 students.

Field Notes Summary

May 2008: Eva formed a strong bond with the other students in the methods class. She felt very supported by their comments, as the class quickly became a community. She had some difficulty in teaching the group lesson that got out of hand, but was able to resolve her own feelings even though the others in her group felt extremely disappointed at the outcome of the lesson. Eva reached this resolution by critically reflecting upon her personal beliefs in relationship to her peers.

During the methods semester, Eva greatly valued the video and peer feedback provided by the methods curriculum. It was useful to her to be able to have her peers comment on how she taught the lesson, and whether or not she fulfilled the objectives. She paid close attention to the context of being a teacher, as well as her current and future growth as an educator. Eva gained practice in inquiry teaching and learning in her clinical field placement, and also learned a few techniques about how to manage behavior in a classroom.

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The support of Eva's cooperating teachers was very important and meaningful to her. She had many conversations with her cooperating teachers about her intrapersonal skills and her interpersonal skills. She had struggled in the early days of teaching chemistry, then resolved her struggle, and pushed through her nervousness and lack of confidence to perform successfully.

In the student teaching semester, Eva focused frequently on reflecting about her planning, developing an organized way to prepare for a lesson. She had several opportunities to present content to the students that she had learned first-hand from a semester she spent in Hawaii studying volcanism and geology, and as a result of this experience, she was then able to clearly explain the connection between learning and real world examples, which was one area that was missing in her reflections during the methods semester.

Methods Semester – Field Notes (Fred)

February 2008: As he entered EDSD466 Methods of Teaching Secondary Science in the spring of 2008, Brad responded well to the atmosphere in the class, in which after each lesson, there was a period of peer feedback, both written and verbal. He commented, "I like having other people suggest things." His method of working and teaching was very organized, and Fred had the ability to see the "big picture". Fred's lesson planning demonstrated his ability to think about the content he was teaching as his students would.

Of the four major assignments in the methods semester, Fred's first presentation to the class was a demonstration / lecture about "shrinking liquids". The assignment

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required methods students to plan and deliver a 20-minute lesson in which they would present a demonstration to their peers, and teach a small amount of content, such as that which would be included in a lecture. Finally, each participant was expected to write a critically reflective summary, responding to the questions: “What worked about the lesson, what didn’t work about the lesson, and why?” Participants were expected to use video and peer feedback to evidence their reflective statements. Fred approached the lesson in a thorough and organized manner, allowing wait time for students to form their own questions. He felt it went well and he was comfortable with the content knowledge and in front of his peers. “It paid off to work through the steps of the procedure beforehand and to have questions formulated to engage students during the demonstration.” He felt that he kept things simple and worked to involve all of the students.

Fred’s clinical field experience allowed him to be part of an actual classroom, however much of his time was spent observing, rather than participating. He was able to work with a teacher who had developed a strong classroom management style throughout his many years of teaching. Even though he had a good rapport with his students, Fred felt that Mr. LaFleur, his cooperating teacher, was sometimes unapproachable when he would want to ask him questions. In general, Fred admired Mr. LaFleur’s manner of teaching and thought that he would adopt several of these practices in his own classroom. “This experience has showed me that I need to dedicate myself to teaching and do the best job I can for my students. It has also given me the sense that I belong.”

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March 2008: Several weeks later, Fred presented his second lesson, which was a group lab. The requirements for this activity were similar to the first lesson, but included a lab rather than a demo/lecture and was taught by two or three methods students instead of just one. For this presentation, Fred prepared with two other students. Unfortunately, the day of the presentation, the third group member was sick and not able to participate in the teaching of the lab. Fred and Stephanie (the remaining group member) worked quickly to split up the third partner's parts of teaching so that the lesson ran smoothly. Together they taught a lesson on ecology. As a result, the lesson was a success and both Fred and Stephanie were proud of their quick thinking. In particular, Fred thought he did a good job stimulating the students to work together to develop ideas and relationships by asking intuitive questions.

May 2008: Fred's final teaching lesson focused on environmental interactions between species, because this was a subject that was close to his heart, he enjoyed teaching the lesson. He used an activity where methods students were given an envelope of pictures of animals within an ecosystem, and they had to show how each animal related to the others. However, Fred put a twist on this activity and because he knew all of his "students" well, he found ecosystems that each person in the class may be unfamiliar with, so that although his peers in the methods class may have known about the ecological concepts of the lesson, they would also be learning something new.

During Fred's final presentation of the semester, which was a full microteaching lesson, he remembered having a lot of fun. He felt comfortable and relaxed, and felt as

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though the lesson went exactly as he had planned. As the methods semester drew to a close, Fred became increasingly excited, yet apprehensive about beginning student teaching. He had applied to student teach in Anchorage, Alaska, and as of early December, he had not yet heard whether or not he would be placed there. He planned to move there with his wife, so finding a place to live, and a job for his wife depended upon this decision. Fred continued to remain positive and hoped for the best.

Student Teaching Semester – Field Notes (Fred)

September 2008: Fred's request to student teach in Anchorage was granted, and he quickly moved to Alaska to begin preparing for his new experience. His wife found a nursing job, and they found a temporary place to live. Fred was excited to begin, and arrived for his first day of student teaching at 7:00am. Fred was introduced to his cooperating teachers; James LaFleur and Jack Shepard, and was quickly welcomed by the other faculty members. He wrote in his journal, "I also met a neighboring teacher of Mr. LaFleur's who teaches I-9 [science] and Biology. Shannon is her name and she offered for me to sub for her when she's on maternity leave! How exciting!!" He began his first day by attending staff development meetings that would continue for three additional days, and started to prepare with his cooperating teachers for the incoming students. Fred felt a sense of pride that he was finally in a school, student teaching, which was something he had wanted to do for a long time. He was eager to learn, and viewed every experience as a valuable learning opportunity in which to enrich his professional knowledge. He reports in his journal about his first day:

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I observed Shannon and Mr. LaFleur as they planned their I-9 class all the way through October. They used their lesson plans and resources from the last several years to quickly devise a new plan. I can really see how valuable teamwork and resources can be.

No matter how small, Fred absorbed the new information quickly. He writes in his journal, "I also learned how difficult copying papers at the high school can be. The printers continuously get jammed. Mr. LaFleur taught me to get ahead and stay ahead."

Fred started out by teaching a few activities, in an effort to begin to get to know the students. He followed a pattern where his cooperating teacher would teach an activity, then he would teach the same activity to the next class. Then, Fred started teaching classes on his own. He records in his journal, "Today I taught my first full lesson. I tried to have a nice pace that governed student learning." Eventually, he took on all a full day of classes.

The students that Fred worked with were from a number of ethnic groups. There were a high number of minority students, specifically Alaskan natives. Many students in several of his classes were considered to be "high risk". In an interview (October 2008), he explains how this effected his teaching style:

There are a lot of different learning levels because different student education levels in the class. There's some students that really get what's going on, there's some students that kind of lie in the middle and some that are way out in left field, that's definitely a challenge, just trying to keep it interested enough for the student that gets it, but not so difficult and unmanageable like I know chemistry can be because they're not seeing this. They're not seeing these orbitals, they're not seeing these electrons flying around, you know, it's not a visual thing.

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Fred took these student issues in stride, and he was strict but understanding with his students. During one class, there was a young man who became increasingly frustrated with a lab activity that he did not understand. The task given to the students included cutting shapes out of paper, and pasting them together according to the letters labeled on various sides of the paper. The student had cut many pieces of paper away from the shape, and was standing at the lab table, surrounded by pieces of paper lying at his feet. His face portrayed his frustration. Fred calmly went over to him, and instead of telling him to clean up the mess he had made, Fred first asked the student what he didn't understand. Finally Fred was able to re-explain the instructions, and the young man was so relieved, he started smiling, and began to dance. As Fred walked away, he turned around and said to the young man, "Don't forget to clean this up". The boy smiled and nodded, busy again with his work. Fred definitely seemed to have an intuition for prioritizing the needs of the students.

October 2008: Half way through his student teaching experience, the researcher made a site visit to interview and videotape Fred. Because he was in a new area, away from what he had considered to be his home for the past several years, this seemed to be a welcome visit for Fred. During one of the side conversations during this visit, Fred remarked excitedly, "Can you believe you're in Alaska? Isn't this great?" After reflecting on this visit, the researcher realized that because student teaching can often be isolating, it was probably very important for Fred to gain outside acknowledgement of the change that had taken place, both in his geographic location and in his professionalism.

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As the semester continued, Fred successfully completed his student teaching, began to substitute for Shannon, and decided to remain in Anchorage with his wife and look for his first teaching job.

Field Notes Summary

December 2008: During the methods semester, Fred showed that he was eager to learn, and intent upon developing his own theories. He valued making content understandable to the students. At first, he seemed to be more of an observer in methods class and in his clinical field experience, however as the semester progressed, he became very thoughtful about what he contributed, and made meaningful connections between what he already knew and what he was learning. It was clear to see that during his time in methods class, he was consciously incorporating his prior knowledge with the new content presented in class and applying it to his clinical field experience.

Fred also showed that he was able to conduct inquiry lessons, and had a calm, easy manner. He demonstrated a strong content knowledge, and was excited to use his upcoming student teaching experience as an opportunity to build his skills.

During the student teaching semester, Fred learned through trial and error. He was a hard worker, earnest and eager to learn as much as he could. He used new methods of technology in his lesson, such as a 'clicker mechanism' to assess students' answers. He connected readily with the students and formed a bond of trust with them.

Fred actually stopped to look at the students he was teaching to find out if they understood what he was saying. They were from diverse backgrounds, and many were

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considered to be ‘at risk’. Fred knew that he was important to them. They weren’t the type of students who had the motivation to pick up a book and learn by themselves. He had a gentle and easy manner with them, yet was authoritative as needed.

Methods Semester – Field Notes (Michael)

September 2007: Michael entered his senior year of school taking two methods classes in the fall semester; EDSD466 Methods of Teaching Secondary Science, and EDSD461 Methods of Teaching Secondary Math. Upon entering these classes, he had many pre-conceived notions about how Physics should be taught. He had mentally gathered information about teaching from his previous experiences as a student, a tutor, and a football coach. He knew most of the professors in the education program were former teachers and had taught some time at the high school at one time or another. However, he admitted, “I just feel like the university setting is so far removed from the high school classroom and really what it’s going to be like.” He realized that he was looking forward (for the first time) to “get in and actually have some real time to sit down with the teacher.

Of the four major assignments in the methods semester (Appendices 14-17), Michael’s first presentation to the class was a demonstration / lecture about a basic physics concept. The assignment required methods students to plan and deliver a 20-minute lesson in which they would present a demonstration to their peers, and teach a small amount of content, such as that which would be included in a lecture. Finally, each participant was expected to write a critically reflective summary, responding to the

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questions: “What worked about the lesson, what didn’t work about the lesson, and why?” Participants were expected to use video and peer feedback to evidence their reflective statements. Michael spent the majority of his preparation effort by focusing on the lesson itself, making sure that it was working, and relying entirely upon his own interpersonal skills to create a concise, clear presentation. However, after teaching the lesson and watching the video, he realized that this singular focus was his downfall. “I now realize that the material and the demonstration is only half the battle.” He realized that he should have spent time preparing differently, to have clearly understood the connection between the different concepts displayed in the lesson. He felt that having a diagram ready to hand out to the students or writing equations on the board would have helped as well. He explains in this first interview,

I look at my attitude and game-plan prior to my demonstration and realize that I was teaching the subject in a way that would have appealed to *me*. I now need to be able to address other styles of learning and cover all of the necessities to the maximum number of students.

After seeing the video of his teaching, Michael had a new way to assess his progress, that he was excited to implement in preparation for his next lesson.

October 2007: During his second presentation to the class, which was a group lesson with two other people, Michael taught an activity on ecosystems. “It bothered me a bit at times.” He admits, “I usually don’t like group work, and prefer to be in a leading role if I am working with a group”. Michael felt that the other two group members did such a great job taking initiative and attacking this assignment head-on that Michael felt like it would have been counterproductive to wrestle for a leading position. He decided

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instead to settle into his niche among the group and do whatever he could to help out, such as being a person to bounce ideas off of, or hosting dinner meetings at his house. This was an important turning point for Michael, as he was voluntarily venturing into a role, which was unfamiliar to him, and involved supporting people, rather than being the leader.

When watching the video of his presentation, Michael felt his own performance was stronger in certain areas, but there was still more room for improvement. He found that he put almost no prior thought into coming to the lesson with notes, and he viewed this as one of the major components of teaching. He stated resolutely, “It was a sloppy practice.” He realized that he had always been able to rely on his natural ability to interact with people when he had been in a teaching situation, but he was beginning to realize that teaching involved more than that. Michael vowed to script his lecture questions and spend more time preparing what he wanted to say to the class in the next lesson.

December 2007: The last presentation to the class was a full microteaching lesson. Michael used technology, hands on activities, and a demonstration in his inquiry lesson. He felt that after watching the video that he had improved during the semester, and as always, there were things that went well, and things that he could improve. His mission towards improving his preparation of a lesson continued, when he saw how short his closure had been. He knew that whether it be twenty minutes in a methods class or a two hour lab period in a class, he must plan lessons meticulously to allow enough time

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for all three aspects of a lesson; introduction, activity, and closure. He emphasized, “without any of these three components, the lesson might go alright, but it probably won’t go really well.” Michael seemed very eager to gain constructive criticism, and this reflected in his straightforward feedback to the other students in the class Michael became known and respected for his honesty.

September-November 2007: During Michael’s internship field experience, he was placed with two teachers; a physics teacher, and a Geometry teacher. The physics teacher, Mr. Farraday, had an authoritative manner in his classroom. He was a teacher that had a solid command of the students’ attention, because he earned the students’ respect early on. The other teacher, Mrs. Austen, had a different style. She was assertive with her instructions, but phrased them in the form of a request, so as not to seem overbearing. “She was really in tune with her students”. One practice in particular that Michael noticed was her attention to detail when assigning students activities. She explained to him that she understood that some students just need to move around, so she would ask them to pass out supplies or return papers. If the students were restless, she would have them come up to the front of the room for their paper instead of returning it to them. These seemed like small things to pay attention to, but it impressed Michael that she would care about the students this much. When Michael thought about how his classroom would be in the future, he explained his philosophy in terms of subject matter – “Physics is a science that lends itself to so many demonstrations and lab exercises that student motivation shouldn’t be too difficult. I will try to motivate my students with the content

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itself.” Michael’s philosophy would persist through his student teaching practicum as he struggled to find his identity as a teacher.

A method of checking student progress that Michael observed in the math classroom was to give the students small white boards and markers. After Mrs. Austen was done teaching a concept, she would have the students answer example problems on these individual boards and hold up their answers so that she could visually inspect them for accuracy. This process allowed her to check right after teaching a lesson to see if her students had understood the concepts of the lesson. As Michael observed different methods of both classroom discipline and assessment, he thought to himself that he would practice a mixture of assessment techniques, including this idea of using the white boards, to make sure he reached all levels of Bloom’s taxonomy in his teaching. He also visualized having a classroom management style that was likeable, yet commanded the students’ respect.

Throughout the semester, Michael was concerned with not getting enough experience in the physics classroom. Compared with his experience in the Algebra class, where he helped with daily activities, gave individual help, and re-taught material to struggling students, in the Physics class he often sat in the back of the room observing. Several times, however, Mr. Farraday would ask him for verbal confirmation on a formula or concept. Michael was frustrated by this apparent inequity in experiences, as he always saw Physics as being his main content area. He was worried that he would not

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have enough experience teaching Physics to allow him to be successful in student teaching.

At the end of the semester, the evaluations of Michael in each classroom reflected different things. The Algebra teacher, Mrs. Austen, marked the evaluation in a variety of ways, giving a separate answer for each question. She marked some areas as “superior”, some areas as “acceptable”. She also added in comments that referred to specific areas of Michael’s professional growth. She noted that he was reliable, had great content knowledge, was very professional, and made a great effort to get to know the students. The researcher noted that evaluation was thorough, and seemed to be thoughtful of Michael’s experience. On the other hand, Michael’s evaluation from the Physics teacher, Mr. Farraday, did not seem to be as thorough. Each section was marked “acceptable”, and no extra comments were given. The researcher thought that this contrast in evaluation responses could be related in some way to Michael’s experience in each of these classrooms; he felt the time he had been allotted for teaching experience was sufficient in the Algebra classroom, but insufficient in the Physics classroom.

Student Teaching Semester – Field Notes (Michael)

January 2008: Michael began his student teaching at a high school in a suburb of Seattle, that was considered to be one of the most prestigious schools in the area. He was placed with a physics teacher and a math teacher. He began his internship by observing the two cooperating teachers he was placed with, and visiting several other teachers to

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contrast and compare their methods of teaching. He quickly found that the expectations for the students and the teachers were high, especially in the math department. The physics teachers were under less scrutiny, because the state tests did not include physics, and as a result, there was no established curriculum in the school for teaching physics class.

March 2008: Michael took on all of the classes, both Physics and Math, during the same week. This is an unusual practice, but after his first two weeks of observing, he asked his teachers if they would let him take on all of the classes at once. They agreed, and the following week he took on all five class periods. Right from the beginning, he wrote in his journal, "I'm beginning to get a taste of the typical teacher's workload. I continue to be overwhelmed with the amount of tasks and thoughts that go into teaching. Right now I feel as though I'm only struggling to stay afloat." After that entry, Michael's journal writing stopped for the next month. It was during that time that the researcher made a site visit to interview him and videotape his teaching. Because he was in a new area, away from what he had considered to be his home for the past several years, this seemed to be a welcome visit for Michael. After reflecting on this visit, the researcher realized that because student teaching can often be isolating, it was important for Michael to be able to talk with someone who understood the preparation he had gone through for this experience, and who understood the context of the connections Michael was making between what he had learned in the methods semester and what he was experiencing in the student teaching semester. The researcher noted that it also seemed to be a little

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stressful for Michael, because he had not kept up with his journal – although the participants were expected to keep a free-writing journal during student teaching, there were not very many restrictions on how much they had to write, and this practice was rarely monitored. Michael seemed to feel disappointed in himself, because he knew how helpful journaling was for his practice. He resolved to get back on track with his journals that coming weekend. Michael began his next entry with a long list of things he wanted to write about. Journaling was his way of thinking through things, and making sure he recorded and remembered them. There were many lists of thoughts in his journal about what to do in the future based on the experiences he was having in the present.

Michael constantly asked his teachers for constructive criticism. He wanted desperately to know what he could improve upon. He found himself being frustrated by the indirect nature of his cooperating teachers. He commented,

Yeah, and like you know what, just tell me where I'm screwing up. I know I suck at some things, I'm new at this, I'm not going to be good, just tell me where I suck so I can learn and get better.

Michael continued to try to find his identity as a teacher. He thought that it would come together in a more cohesive fashion when he had his own class, because he had always felt, (as many student teacher do) that he was a visitor in the classroom, and not the “real” teacher.

April 2008: Michael completed his student teaching practicum successfully, and towards the end of his semester, his cooperating teacher for physics presented him with

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surveys from each of his students. There were questions centering on student enjoyment, learning strategies, and teaching strategies. She then summarized the comments into a report for Michael. He appreciated this greatly, as it was an additional way for him to improve his practice as well as to remember his students.

Once graduated, Michael was in high demand for job openings, as he was qualified to teach both physics and math, and also had experience coaching football. He accepted a job near where his family lived, and began his first year of teaching.

Field Notes Summary – Michael

During the methods semester, Michael focused a great deal of his attention on preparation. He had very strong opinions of what a teacher should do, but his opinions were based on theory, rather than experience. He followed up these opinions at first by offering several suggestions to the researcher, the field placement office, and the education department chair about how he felt the teacher preparation program could be structured differently.

As the semester progressed, Michael found that critical reflection gave him a way to remedy what he saw was not fitting in the teacher education program. By paying attention to his own practice, he could improve his teaching, and this became more important to him than offering opinions to others. He focused on preparation, diversity of learners, and responded well to peer feedback and video. He commented on more than one occasion that the interviews for this study helped him a lot, because the interview questions encouraged him to reflect even more on his practice.

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During the student teaching semester, Michael focused on pedagogical content knowledge, trying to find ways to make lessons hands-on, inquiry, and applicable to all learners. He also used ways of organizing content that he had learned in methods class, such as concept mapping, and ways of reflecting, such as peer feedback. He strategized and planned frequently, always thinking of what to do differently. He sought out feedback from his cooperating teachers, however he was not happy with the response that he received. After this, he seemed to be less interested in using additional external data, such as videotaping or student work to inform his practice

The teachers at Michael's school were under a high amount of pressure due to state testing that took place 6 weeks after Michael arrived for his student teaching assignment. In addition, the school was in Seattle, which is a different, more fast-paced culture than the small community Michael had lived in for several years. To compound this stress and pressure, against university advisement, Michael took on all of the classes at once, and as a result, he didn't journal for four weeks.

Methods Semester – Field Notes (Sarah)

February 2008: Sarah entered EDSD466, Methods of Teaching Secondary Science, in the spring. She adapted quickly to the environment, and as she relaxed, her dry sense of humor surfaced. She enjoyed the organization and community aspect of the methods class, because she felt that it was challenging to her and she enjoyed that she was expected to be self-motivated in order to succeed in the class assignments.

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Of the four major assignments in the methods semester, Sarah's first presentation to the class was a demonstration / lecture about volume in response to temperature. The assignment required methods students to plan and deliver a 20-minute lesson in which they would present a demonstration to their peers, and teach a small amount of content, such as that which would be included in a lecture. Finally, each participant was expected to write a critically reflective summary, responding to the questions: "What worked about the lesson, what didn't work about the lesson, and why?" Participants were expected to use video and peer feedback to evidence their reflective statements. Sarah had practiced this lesson at home, but unfortunately did not use the exact same materials, and because of this, her demonstration was not successful. Sarah also struggled, as most physics and some chemistry students do, with transforming what she knew into an understandable lesson for basic learners. It was an eye-opening experience for Sarah, and she used what she learned towards the next lesson. "The next time I do this demonstration, she commented, I will bring in a model kit and show how the molecules interact, as well as drawing them on the board." Sarah would continue to search during this semester for innovative yet rare ways to present inquiry lessons to chemistry students.

March 2008: Several weeks later, Sarah participated in the second presentation, which was a group lab. The requirements for this activity were similar to the first lesson, but included a lab rather than a demo/lecture and was taught by two or three methods students instead of just one. Together, Sarah and her partner taught about the concept of

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catalysts. Her prepared materials worked well in this lesson, however her explanation of the concept was not very clear. There were several questions from the class in an attempt to further understand the concepts. She commented, “It was kind of confusing. I’d worked on it for a couple days but it took me a while to understand exactly what was happening [the scientific concept she attempted to teach] but I finally got it.” She admitted that it was kind of hard to explain and it may not be a good lesson to use in a general chemistry class, but rather in an advanced placement class.

Sarah’s paraprofessional experience was quite an eye-opening experience for her. She had definite opinions about the teachers she observed. She felt the material given to the students was very repetitive. In addition, she commented, “The students are given very little instruction in class and then are told to complete their worksheets.” Despite this disappointment, Sarah reported that the experience was productive, and the three main lessons that she learned were: Each teacher has a different style of teaching, all styles can be effective if presented in the right way, and students need a variety of teaching methods to keep them focused and entertained.

Sarah became increasingly interested in inquiry learning and teaching. In planning her lessons, she was surprised to find how few chemistry lessons were inquiry-based. In part, she understood this to be in regards to safety, but she made it her goal to develop inquiry-based chemistry lessons. She knew that this would be a way that she could make teaching meaningful, as her father did in his classroom.

APPENDIX K CONTINUEDStudent Teaching Semester – Field Notes (Sarah)

September 2008: Sarah entered her student teaching semester at a local high school. She felt that she was well prepared and was eager to begin. She was assigned two cooperating teachers, Ms. Reyes and Ms. Linus. The plan was for Sarah to teach four periods with Ms. Reyes and one period with Ms. Linus. Both teachers taught Chemistry, but the students assigned to Ms. Reyes's classes were honors students, and there were very few behavior problems. Ms. Linus's students, on the other hand, scored very low, test after test. There were numerous behavioral problems with the majority of the students.

Sarah's first few weeks involved observing her cooperating teachers, of which Sarah quickly grew tired. She had very strong opinions about the administration and the manner in which Ms. Reyes taught, commenting, "if I were teaching the class, I would not put that much emphasis on graphing. It seems like a waste of time and the students seem to get frustrated." Sarah also had very strong opinions about the students in Ms. Linus's class. "It is very frustrating to have students who don't seem to care. All they want to do is blow things up, which they will never do. I think more interesting material needs to be found or more activities." When she began teaching, she started with period 3 in Ms. Reyes's class. She gradually took on all of the classes during the next few weeks. Sarah quickly found that it was very difficult for Ms. Reyes to relinquish control of her class. There were times that they team taught, an activity in which Sarah found

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great value, but there were other times, when it was agreed that Sarah would teach the class, and Ms. Reyes would interrupt her teaching to add a thought of her own. Sarah quickly became nervous, because each interruption not only stopped her train of thought, but it seemed to her that Ms. Reyes didn't trust her or, felt that Sarah couldn't handle the job. She approached this topic with Ms. Reyes, who was direct and honest with her, saying "I don't want to give up my class". Sarah thought that this conversation would make a difference, however the situation did not improve, and Sarah continued to struggle with this throughout the semester.

In Ms. Linus's class, Sarah began teaching, and after the first week, she was already exhausted. The discipline problems in this classroom surprised Sarah, as she thought that the students would be more mature. She had a conversation with them after the first week, telling them that how they were acting was disrespectful and hurtful to her. By introducing her feelings and emotions into a budding relationship with the students, she thought that it would change things, however it only seemed to make things worse, or at least to continue the established pattern of classroom misbehavior. She explained,

The third period, class was ok but I'm still not getting their full attention. I think I'm giving them too much credit. I treat them as if they are adults and know when to pay attention and take notes, when that is not the case. I think the kids are smarter than they really are.

Sarah turned this over in her mind, time and time again, and tried everything she knew of, and some things she didn't know of, to try to impact this situation. She continued,

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I am going to dramatically change my teaching style to something that is more comfortable for me, and fun for them. I have many ideas in mind. How to light a fart demo! This was fun for everyone. Temperature and volume and density were covered first, then gas (methane) was bubbled through a solution of soap and the bubbles were then lit on fire. The students really enjoyed this demo. It showed difference in the densities of gasses.

November 2008: During the middle of this semester, the researcher made a site visit to interview and videotape Sarah's teaching. Although Sarah's frustration and lack of success with period three could be considered a normal situation, Sarah emphatically declined the researcher's offer to videotape her teaching of this class. The researcher felt that this was unfortunate, because the practice of videotaping one's teaching had been shown to impact one's practice, and she felt it could benefit Sarah's professional skills and dispositions, especially in this situation. The researcher inquired of Ms. Linus as to why Sarah might feel this way, and Ms. Linus also suggested the videotape and reflective summary, but Sarah would not be budged. It was never fully clear as to why she would not agree to videotape this class, but the researcher thought that it was possible that Sarah was so frustrated (and possibly embarrassed) by the situation that she was not able to even begin to look at her practice in a critical way. The researcher also thought that it was possible that Sarah's additional frustration with Ms. Reyes's frequent interruptions could have compounded the situation for Sarah. In reviewing the videotapes of Sarah's teaching during this time, it was clear that Sarah was most relaxed when Mrs. Reyes was not present in the classroom. Each

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time Mrs. Reyes interrupted Sarah, the researcher could visibly see a change in Sarah's posture, facial expressions, and interactions with the students in the class.

Despite all of this frustration, Sarah finished up her student teaching semester successfully, and was relieved when it was finally over. She was left with definite questions about whether or not she wanted to teach high school. She received a job offer to be an adjunct instructor at the same college where her father taught, and she readily accepted this position of teaching college chemistry, which began following semester.

Case Summary – Sarah

During the methods semester, Sarah saw great value in having a videotape of her teaching, because it allowed her to remember clearly what happened in class. From her comments, it seemed to the researcher that she entered methods class as well as the clinical field experience having the mindset of someone who was there to judge or evaluate, but did not yet have the skills that would allow her the ability to critically evaluate the situation. She placed a high value on content as well as inquiry teaching and learning, and was disappointed and surprised not to find readily available inquiry lessons for chemistry concepts.

Sarah had difficulty thinking about her lessons as a student would, and her teaching reflected this, as Sarah sometimes struggled with getting the content across in an effective manner. Sarah found that the critical thinking that was necessary when

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participating in a peer feedback environment was challenging to her, because she needed to think about the lesson that was being presented in several ways.

During the student teaching semester, Sarah enjoyed the classes with well-behaved students the most. She struggled with developing classroom management skills throughout the semester. She also had difficulty with her relationship to the cooperating teacher, and these two struggles stopped her quite often from reflecting in a critical way. She still behaved as an evaluator, but made significant progress in this area, as her judging and evaluative comments less frequent. She tried to change her way of teaching, to be able to reach the students more easily, and attempted numerous ways of making the content attractive to the students with whom she had the most difficulty.

Methods Semester – Field Notes (Stephanie)

February 2008: During Stephanie's spring semester in Methods class, she was extremely busy. She needed to organize her wedding, prepare to move to Denver, apply for a student teaching position in a suburb of Denver, and work about 40 hours a week as a waitress at a local restaurant in town.

Of the four major assignments in the methods semester, Stephanie's first presentation to the class was a demonstration / lecture about muscle fatigue. The assignment required methods students to plan and deliver a 20-minute lesson in which they would present a demonstration to their peers, and teach a small amount of content, such as that which would be included in a lecture. Finally, each participant was expected

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to write a critically reflective summary, responding to the questions: “What worked about the lesson, what didn’t work about the lesson, and why?” Participants were expected to use video and peer feedback to evidence their reflective statements. Stephanie kept the pace of the class moving, posing many questions to the students. She then reviewed her progress on video, and in her reflective summary, she commented that she would have liked to have more time. She felt that she was focused on teaching all of what she wanted to get across, regardless of the time. She also thought that she should explain the instructions more clearly. She felt that she would like to improve her strategies of dealing with time and focusing the demo towards one main idea, thus making her demos more efficient and structured.

March 2008: Several weeks later, Stephanie presented her second lesson, which was a group lab. The requirements for this activity were similar to the first lesson, but included a lab rather than a demo/lecture and was taught by two or three methods students instead of just one. For this presentation, Stephanie prepared with two other students. Unfortunately, the day of the presentation, the third group member was sick and not able to participate in the teaching of the lab. Stephanie and Fred (the remaining group member) worked quickly to split up the third partner’s parts of teaching so that the lesson ran smoothly. Together they taught a lesson on ecology. As a result, the lesson was a success and both Stephanie and Fred were proud of their quick thinking. Stephanie commented to the researcher, “it was interesting to see different personalities, ideas, and strategies come together to form [a group idea]. I think it was a good example of how

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group activities could be carried out in a classroom.” Stephanie also learned from this experience that it was important to find different ways to compliment individual needs and characteristics. She also thought about how she might make this lab less complex to deliver at a younger age.

Stephanie’s clinical field experience took place in an alternative high school. The students she worked with had a multitude of challenges, ranging from drug and alcohol abuse to homelessness to teen pregnancy. They were no longer permitted to, or chose not to attend the mainstream high school. For some of these students, coming to school each day was a struggle. Half way through the clinical field experience Stephanie wrote in her journal about a particularly meaningful moment when she learned a lot about the students she was teaching:

Today, two senior students called an assembly for the whole school. They had conducted a survey on respect in the school. They told students that something needed to change and it is a privilege to go to this school, as each student applies to be enrolled in the alternative setting.

Stephanie realized that although she had initially stereotyped the students at the alternative school, she no longer viewed them in a negative light. She was impressed that they not only acknowledged issues that they wanted to change, but they also spoke up and were leaders for their peers.

April 2008: Stephanie’s unit plan, the third major assignment in methods class, reflected the knowledge, skills, and dispositions she had learned during the clinical field experience. The expectations for this assignment was for the methods students to write a

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week long unit plan that they would potentially use in their career. Stephanie skillfully developed alternative lessons and assessments, inquiry activities, and individual research for her potential students. It was very important to her to be able to reach all students in her classroom.

May 2008: At the end of her clinical field experience, Stephanie felt motivated and inspired to enter student teaching. She commented, “I have learned so much from this experience. It was kind of a challenge to begin with but there is a lot more going on at that school than I first knew. I will definitely take this experience into my future teaching!” She also felt that she would like to focus on continuing to develop her ability to accommodate students, getting to know individual students, practice multiple teaching strategies, and gain confidence in her teaching style.

Student Teaching Semester – Field Notes (Stephanie)

September 2008: After the spring semester, Stephanie had gotten married, found a place to live in Denver, and went on her honeymoon. Acceptance of her student teaching position at the high school had required an in-person interview, which she navigated professionally. Shortly after the interview, she was offered the student teaching position. The high school where she would be student teaching was a public school, serving 1500 students from grades nine to twelve. It had earned a reputation as one of the most renowned schools in the area. One of the school policies is that students are only allowed to be exposed to new learning experiences on four days out of the five day school week, so many Fridays included scheduling of school activities and “review days”.

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Stephanie taught ninth grade physical science, 10th grade biology, and 11th and 12th grade zoology. There were approximately 30 students per class. The science department was very collaborative, and planned together. They had meetings once or twice a week to make sure they stayed on the same page. For biology, the teachers wrote their tests together, giving the same test to all students in the 10th grade, but maintained their independence as teachers by using their own worksheets, powerpoints, and approach to the topic. Stephanie explains how she adjusted to the environment,

I've been having to, like when we do the science department meetings and we give out what we want to do, I've been having them [the other science teachers] modify it to explain it in the best way I can. Like they might explain it differently, so I've had to modify it so I feel comfortable teaching it. And I feel comfortable with my students knowing what I teach.

This experience of collaborative planning benefited Stephanie, and she learned to contribute as an equal during the meetings.

October 2008: The teachers shared the classrooms, so it was necessary for Stephanie to be 'mobile', switching her materials from room to room. This was challenging for her, but she was very organized, so it worked out well. She found that while she was organized, her cooperating teacher was very laid back and not at all organized. She wrote in her journal faithfully every evening, so she would not be so overwhelmed. She came to realize that preparation and keeping up with her grading was key to her success as a teacher.

Stephanie fell very quickly into her responsibilities as a student teacher, and made personal connections with some of the students. She smiles as she remembers, "there was

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a popular girl, she didn't come to class or try, she failed the first 2 tests, I took the initiative to talk with her, and she got one of the highest grades on the next test. She said to me 'You're the only teacher that cared to help me out'." Stephanie also dealt with numerous classroom behavior issues, which could have been contributed to by the lack of her cooperating teacher's support with classroom management issues, or the school policies, among which, allowed students to listen to their i-pods in the classroom given that they had completed the work that had been assigned. Stephanie continued to focus on her interactions with her students throughout the semester.

At this time, the researcher made a site visit to Stephanie's school. She observed Stephanie teaching several classes. One major issue that the researcher identified from observing Stephanie's classes is that the behavior of the students was not regulated by Stephanie. The researcher concluded from the site visit that three factors influenced this problem: The school climate, the behavior management techniques of the cooperating teacher, and Stephanie management practices.

First, the school climate allowed students to listen to i-pods during school hours, including in the classroom. The school had also agreed with the parents of all students that new material would only be taught four days out of the week. As a result of these two policies, students often listened to their i-pods instead of the teacher, and seemed to view this last day of the week as a "fun day". Many teachers chose to review on Friday, so the students knew that on a Friday, they could come to school and not be expected to produce anything.

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In addition, Stephanie's cooperating teacher was generally unorganized and did not have many classroom rules. During Stephanie's student teaching practicum, she and her cooperating teacher were constantly dealing with behavior, disrespect, and attendance issues. Stephanie's classroom management style seemed conflicting – for example, in one class, she told the students to be quiet, then asked them a question, then when they answered, she said “shhhhh”. Or, in the same class, she told them that the bell had rung, and if they weren't in their seats, they would be marked late. Then, she did not fulfill on this promise.

The researcher asked Stephanie about these issues that the researcher had identified as classroom management issues, and Stephanie's response was to provide an explanation. During the interview, the researcher kept asking Stephanie about these issues, but whatever issue the researcher brought up, Stephanie had an explanation. The researcher concluded that Stephanie was not aware of these situations, and was not able to be prompted into thinking critically about her teaching practice in this situation.

Stephanie completed the semester successfully, began substitute teaching right away, and the following semester accepted a position at one of the Denver metro schools closer to her new home.