NEGOTIATING A UNIVERSITY-SCHOOL PARTNERSHIP: EXPLORING STAKEHOLDERS' COMMITMENTS CONCERNING ELEMENTARY SCIENCE TEACHING

by

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(Under the Direction of Julie Kittleson and Deborah Tippins)

ABSTRACT

Across the United States, university-school collaborations have been initiated to promote science teaching and learning in elementary schools. Many of these partnerships have focused on professional development for classroom teachers. Recent concerns over the state of science education in the United States have prompted the development of programs that partner universities and schools to increase science achievement among students in this nation. One such university-school collaboration known as Project FOCUS: Fostering Our Community's Understanding of Science, was examined in this study. This program places university science majors in elementary schools to promote science learning for elementary students and their teachers.

This qualitative study examined the ways in which stakeholders associated with Project FOCUS negotiated the experience. Stakeholders included classroom teachers and the university science majors placed in their classrooms, along with the developer of Project FOCUS and the school principals. All stakeholders were interviewed throughout the study to ascertain ways in which they negotiated the FOCUS experience. In addition to interviews with stakeholders, data

sources included observations and copies of written work from the university students participating in FOCUS.

Community of practice, situated learning theory, and discourse served as a foundation for the theoretical framework of this study and as a context by which to explore how stakeholders negotiated the university-school partnership. The methodological framework for the study was derived from discourse analysis that focused on how stakeholders spoke about their experiences as well as interpretation of the meaning behind the words they used, the larger social context of language, and how words were used in action. Gee's (1999) discourse analysis guided the construction of stakeholder portraits and scenarios of the negotiation activities. Analysis revealed the commitments, communities of practice, and underlying "Discourses" that contributed to the negotiation of the experience. The findings from this study were that although FOCUS seemed to work in its existing context it did not require the classroom teachers to form a commitment to the program. Implications for university-school collaborations, science teaching, teacher education, future research, and methodology are explored.

INDEX WORDS: University-school collaborations, Elementary school teachers, Science teaching, Science instruction, Science teacher education, Communities of practice, Stakeholders, Negotiation

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Chapter One: Introduction

Improving elementary science education is recognized as a pressing educational issue (Marx & Harris, 2006). Educators understand that a number of dimensions contribute to successful science instruction, such as well-prepared teachers, adequate time, and quality instructional resources. Some researchers suggest that many elementary teachers feel unprepared to teach science (e.g., Beerer & Bodzin, 2004; Cannon & Sandler, 2000; Ediger, 2001; Rigden, 1999; Ross & Mason, 2001). Across different contexts, university and school collaborations have been initiated in an attempt to improve science teaching and learning (Smith & Trexler, 2006). The intent of this study was to examine how collaborative efforts between a university and two elementary schools provided support for science teaching.

Previous research has documented benefits of university and school collaboration for professional development (e.g., Callahan & Martin, 2007; Coble & Azordegan, 2004; Teitel, 1999). Many examples of collaborations have documented professional development opportunities for elementary teachers. For example, Benton and Schillo (2004) described an action research project in which they studied the implementation of a literacy professional development that included both teachers and university professors. They found that the partnership resulted in not only teachers, but also university professors, taking what they learned from the experience and applying it to their classroom practices. Another example of how university school collaborations have been used for professional development in science education stems from the work of Smith and Trexler (2006). In their program, a university-

school collaboration was formed in which college science students worked with elementary teachers throughout a given school semester to implement a curriculum designed in conjunction with education faculty, undergraduate students, and classroom teachers. Results from their project evaluation indicated that the teachers found the program to be very valuable to their professional development. Most teachers felt that as a result of the workshop they had an increased understanding of science and the confidence to provide hands-on activities to their students.

Rationale for the Study

Although several examples of university-school collaborations have been described, there is limited research on how partnerships between universities and schools are actually implemented (Smith & Trexler, 2006). This study focuses on one such partnership between a university and two elementary schools. The partnership was more specifically built around university students working with teachers to promote science learning for elementary school children. This partnership is designated a university-school collaboration instead of a school-university collaboration because although both institutions are heavily involved in the program it was initiated at a university, by a faculty member, and continues to maintain financial support from this institution.

In the state in which this study was conducted, the Science, Technology, Engineering, and Mathematics (STEM) initiative has called for increasing the number of students interested in science and mathematics (Board of Regents, 2008). University and school partnerships have emerged in response to this call (e.g., Pultorak, McCarthy, & Young 2006; Smith & Trexler, 2006; Sterling, Matkins, Frazier, & Logerwell, 2007). While such partnerships have potential to support STEM education, it is important to consider that, “while we understand the impetus for

such mandated collaboration and creation of partnerships (between schools and universities), it is not easy to create meaningful relationships when partnerships are often loosely defined and initiated by external impetuses" (Benton & Schillo, 2004, p. 30). Comments such as this indicate the need for further research regarding the nature and outcomes of partnerships; this study investigated a partnership focused on science teaching for young children.

Overview of FOCUS

The partnership that served as the centerpiece of this study is known as Fostering Our Community's Understanding of Science (henceforth referred to as FOCUS). This program was initiated in 2002, and it pairs undergraduate science majors from Magnolia State, a large land-grant institution, with elementary public school teachers, in the same county, to promote science learning for elementary school children. The goals of the program include:

1. Improving the science experiences and science content knowledge of elementary students through relevant and hands-on science instruction;
2. Increasing awareness among elementary students about career opportunities related to the sciences;
3. Providing experiences to students and teachers that will bring about more positive attitudes about science;
4. Improving the content knowledge and confidence of local elementary teachers to bring about sustained, positive changes in how they approach science;
5. Developing a sense of community involvement for university students that will continue after graduation;
6. Promoting science in a positive way to the elementary students and teachers who work with university students;

7. Enhancing the communication and leadership skills of university students.

Although some of the goals of FOCUS listed above include aspects of teacher learning it is important to note that the primary goals of FOCUS center on increasing elementary students' exposure to science and science learning.

Each semester university students, who are typically science majors, sign up for FOCUS by first completing an application expressing their interest in participating in the program. They provide information such as GPA, number of science hours acquired, degree major, reasons for why they want to participate in FOCUS, and previous experience working with children. FOCUS is a three-hour credit course that serves as an elective towards degree requirements. To participate in FOCUS a student must have a 2.5 GPA or better and have completed at least twelve credit hours in science.

Once admitted to the program, FOCUS participants work a minimum of three hours each week in the classroom with a partner teacher. This time is to be dedicated to teaching science, although students may have to help with other subjects to meet the needs of the individual teacher. FOCUS students help plan lessons that are hands-on in nature. In addition, FOCUS students meet for a weekly, one-hour reflection session. During these meetings, students receive help with science lesson ideas and experiments, discuss experiences, get introduced to topics in science education, and support one another. Students also have to write a reflective journal entry each week. The reflective journal is expected to be thoughtful and reflective of their experience in the classroom. The course responsibilities in total are meant to consume 8-9 hours of work each week. Now that an overview of the program has been provided it is important to delineate why this particular study was conducted. Further details of FOCUS will be explained in the method chapter.

Purpose of the Study and Research Questions

To date, researchers have examined the learning styles of university students participating in FOCUS (Scott, Oliver, & Knauft, 2005; 2007). However, no studies have considered the experience of various FOCUS stakeholders as they interact to negotiate science for elementary learners. The purpose of this study was to understand how university students, faculty, and classroom teachers interacted to negotiate FOCUS. When people negotiate, they weigh their own way of thinking about an experience such as FOCUS in light of the experiences of other stakeholders. In the process, they may transform their ideas and their ways of thinking about elementary science teaching and learning.

To learn more about the efficacy of Project FOCUS the following research questions were asked:

1. What are the commitments stakeholders bring to the FOCUS experience?
2. Why do stakeholders choose to participate in FOCUS?
3. In what ways do stakeholders from various communities of practice negotiate FOCUS?
4. What are the productive and unintended outcomes of negotiating the FOCUS experience?

The findings from this study have the potential to inform how university-school collaborations are structured. Additionally, this study may contribute to understandings of how collaborative efforts between universities and elementary schools can promote science teaching and learning. Finally, it may elucidate the impact that "science experts"—in this case, university science students—have on elementary students and teachers, shed light on ways to revise FOCUS to ensure its continued success, and inform the development of similar collaborations. If

researchers want to better understand collaborative efforts between schools and universities, then a need exists to understand how stakeholders negotiate FOCUS.

Overview of Theoretical Framework

The theoretical framework for this study builds on understandings of communities of practice, situated learning theory and discourse. The notion of communities of practice provided a context for examining the FOCUS university-school collaboration. This idea was important to the study because it allowed the researcher to consider how FOCUS participants came to the experience with existing ways of viewing the world and how they acted in it. Situated learning theory was helpful in understanding how the participants' communities of practice informed the ways in which they participated in FOCUS. Discourse informed the theoretical framework and complemented the notions of communities of practice and situated learning theory. Discourse was used as a way to understand how FOCUS participants negotiated the experience and the deeper context of the commitments they brought to it through their existing communities of practice.

Overview of Methodological Framework

James Gee's (1999) discourse analysis was used to guide the methodological framework of this study. Gee (1999) uses Discourse with a capital "D" to ask questions about how language can be used to communicate and influence the meaning of words in different contexts. Gee's framework was used to understand the negotiation of FOCUS as represented through not only what participants said, but how aspects of the social world impacted their language use. For this study, analysis began by looking across the spoken and written discourse and then moved to use building tasks that Gee provides to guide further analysis and eventual interpretation.

Subjectivities Statement

It is important for any qualitative researcher to illuminate subjectivities he/she brings to the study. One of the subjectivities that I have stems from my participation in FOCUS as a student several years ago. Because I have participated in FOCUS as a student and then graduate coordinator I have ideas about what the program and experience should mean for all participants. I believe that although FOCUS students come to the program with the intent to share science with elementary students some of them see it as a way to increase their chances of being accepted to medical school. When I first came to the FOCUS experience it was a place and time for me to determine if I would remain in science research or begin a degree in science education. Clearly, I chose the later but know that this experience was "life-changing" and something I had to keep in mind when speaking with participants about their interest or lack of interest in teaching as a career path. Another subjectivity that was revealed to me as I conducted my research was that the vision I have for FOCUS was not always being actualized in the classroom. This subjectivity comes from me not only being the researcher of this study but concurrently the graduate coordinator of FOCUS. At times, I felt that I was not doing enough to make the program successful in terms of its effect on science teaching and learning. I had to be aware of my biases that were forming as a result of not only being the graduate coordinator for FOCUS, but also my concern for the state of science education at the elementary level. I was cognizant of the fact that my own interests and concerns for science education held the potential for me to draw unreasonable conclusions from this study or ones that were not actually representative of the data as a whole. It is worth noting that as the graduate coordinator I was in charge of overseeing 60 university students paired with 60 different elementary teachers each semester. As a result, I had contact with approximately 180 university students and 180

elementary teachers over the year and a half I was the graduate coordinator. Even though I worked with only four university student/ elementary teacher pairs in this study it cannot be ignored that I had contact and experiences with many more FOCUS participants. Although the experiences I had as the graduate coordinator did add to my subjectivities it was not the goal of this qualitative study to make generalizations about the program but offer insight into how the results of this study could be transferable to some aspects of FOCUS and other similar collaborations. According to Lincoln and Guba (1985) transferability refers to the level to which qualitative research can be transferred to other contexts or settings. It is this transferability that allowed me, the researcher and graduate coordinator, to not make generalizations about the entire FOCUS program but concentrate my efforts on how the four pairs I studied were situated within this particular context. In addition, I felt my own subjectivity was negated by talking through the data with my advisors, having discussions with peers, and member checking with the actual study participants.

Preview of Remaining Chapters

Chapter Two begins with a literature review based on a summary of the current status of elementary science achievement and science education policy in the United States. Also, literature that reveals tensions central to facilitating meaningful science teaching and learning in elementary education in the United States is explored. The last section of chapter two presents an outline of the theoretical framework, which builds on Lave and Wenger's (1991) and Wenger's (1998) notion of communities of practice to set the stage for how the analyses for this study were conducted.

The methodological framework for this study is presented in chapter three. James Gee's (1999) discourse analysis was used to frame this study, and chapter three provides a rationale for

using the framework in conjunction with communities of practice. The methodological approach, participant selection, data collection, descriptions of participants, and data analysis are presented

Chapter four is the first of three chapters in which findings from the analysis are presented. This chapter describes the contexts in which FOCUS was situated. The university context was represented by way of the program developer and a former graduate coordinator. The elementary school context was represented by way of principals whose schools participated in FOCUS. Discourses that were important to the context of the elementary schools situated within the larger FOCUS context are discussed.

Chapter five describes the participants and the broader FOCUS context. First, portraits of the classroom teachers and FOCUS student participants are presented. These portraits introduce the classroom teachers and FOCUS students as the main stakeholders in this study. Their backgrounds, their experiences with science, and other pertinent information are presented in this chapter. Additionally, the portraits describe the communities of practice and commitments the classroom teachers and FOCUS students brought to the FOCUS experience.

In chapter six, scenarios are presented to depict how negotiation between the classroom teachers and FOCUS students were carried out during the FOCUS experience. One scenario for each of the five negotiation activities was developed to represent how the specific FOCUS student/teacher pair negotiated the given classroom activity; these were also compared and contrasted across the pairs. The scenarios were intended to address the question of how stakeholders from various communities of practice negotiated FOCUS. The final portion of chapter six reveals themes situated within the communities of practice associated with the larger FOCUS context that were helpful in addressing productive and unintended outcomes of negotiating the FOCUS experience.

The final chapter provides conclusions regarding the ways in which stakeholders negotiated the experience, as well as the Discourses that became apparent through this negotiation process. Also, productive and unintended outcomes associated with negotiating FOCUS are discussed. In addition, implications and recommendations for the future of FOCUS and other similar university-school collaborations, as well as for elementary teachers and teacher education are provided. Lastly, a discussion of implications for future research and methodology are discussed.

Chapter Two: Literature Review and Theoretical Framework

Literature Review

Introduction

This section of chapter two includes a review of literature informing this study. Two areas of literature explored were a) the current status of elementary science achievement and legislation pertinent to science education in the United States, and b) the tensions central to facilitating meaningful science teaching and learning for elementary learners in the United States. The literature on the current status of elementary science achievement and legislation pertinent to science education was important for understanding where elementary science learning stands today to draw meaningful implications from the study. Because the study was based in the context of a university-school partnership, it was also important to review the literature on tensions central to facilitating meaningful science teaching and learning for elementary learners. This literature review was limited to the United States since this study and FOCUS program took place in elementary schools in this nation. U.S. schools operate within unique policies and structures and these were important to how FOCUS was carried out in partnership within elementary schools. Insight could be gained from looking at the status and tensions around elementary science education in other nations but this was beyond the scope of this study and literature review. This literature review was constructed by researching in databases that were related to education, specifically science education, and were found to have sources not only pertinent to this study but also published in the last ten years. The literature review was limited to the last ten years of research on these topics because FOCUS has been in

existence for less than ten years, there have been federal mandates that have affected elementary schools in recent years, and the intent of this review was to concentrate on the current status and tensions surrounding elementary science education. The author deemed the last ten years of research rich enough to elucidate the achievement of elementary learners, current legislation meaningful to science education, and tensions that surround elementary science education. There were a select number of articles that were used in this review that were more than ten years old but the author felt these studies and findings were important enough to the context of this review and thus were included.

Status of Elementary Science Achievement

> So, while administrators and teachers are focused on frantically trying to improve reading, writing, and mathematics scores on high-stakes testing, as prescribed by the No Child Left Behind Act, it is important to recall that science in the elementary grades is being left behind (Goldston, 2005, p. 186).

This quote from Goldston, made in an editorial note in the *Journal of Science Teacher Education*, reflects the current concern over the state of science education in the United States, specifically at the elementary level. The concern is not new but stems from a long history of our nation's worry over the state of science education and our production of science and scientists. While mandated standardized testing and federal policy have been a part of recent educational reform, the historical preface of these events is important to mention before discussing how the situation described by Goldston came into being.

Although there seems to be a heightened concern over science and science education today (Council on Competitiveness, 2004) the worry over these areas has been an issue discussed in the United States for quite some time. This conversation can be traced back to the 1950s with

the launch of Sputnik, continuing into the Reagan era with the publication of "A Nation At Risk" in 1983 and more recently with the implementation of The No Child Left Behind Act of 2001 by the George W. Bush administration. With the long history of concern for the production of science, scientists, and science research in the United States why hasn't science become a priority in schools, specifically elementary schools, today? The particular legislation of NCLB states the following:

> The purpose of this title is to ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments (NCLB, 2001, Sec. 1001).

Although the NCLB Act of 2001 called for high quality education and proficiency on state academic assessments, science at the elementary level has yet to be included in the mandatory Adequate Yearly Progress (AYP) Report. AYP defined that "each State plan shall demonstrate, based on academic assessments […], what constitutes adequate yearly progress of the State, and of all public elementary schools, secondary schools, and local educational agencies in the State […] (NCLB, 2001, Sec. 1111, [2], [A]). As the following passage from the NCLB Act states, science was to be included by the 2007-2008 school year.

> Each State plan shall demonstrate that the State educational agency, in consultation with local educational agencies, has implemented a set of high quality, yearly student academic assessments that include, at a minimum, academic assessments in mathematics, reading or language arts, and science that will be used as the primary means of determining the yearly performance of the State and of each local educational agency and school in the State in enabling all children to meet the State's challenging student

> academic achievement standards, except that no State shall be required to meet the requirements of this part relating to science assessments until the beginning of the 2007–2008 school year (NCLB, 2001, Sec. 1111, [3], [A]).

In the state of Georgia there also seems to be ambiguity about when science will become a part of AYP. On January 8, 2009 Kathy Cox, the State Superintendent of Schools for Georgia, received a letter from Kerri L. Briggs, the Assistant Secretary for the Office of Elementary and Secondary Education at the United States Department of Education (U.S. Department of Education, 2008). The letter included information about Georgia's compliance with including results from the science portion of the state assessment to make AYP. Dr. Briggs informed Dr. Cox that Georgia schools failed to include these results, from the 2007-2008 school year, but would need to do so, for grades 3-8, for 2008-2009. At the community level, several of the elementary schools that participated in Project FOCUS had not made AYP two years prior to when this study was conducted (Office of Continuous Improvement, 2007).

With the pressure surrounding accountability, particularly in elementary schools, was it fair to add another subject, besides language arts and mathematics, to AYP? Goldston (2005) offered her comments on where this left science in the elementary grades.

> As a result, science class time, especially in the elementary grades, has been reduced to a vestigial organ whereby science is taught using traditional approaches or, in the worst cases, has been excised from the curricular body (p. 185).

Another part of the concern over science education in this country came from comparisons made to other nations. There was evidence that our young students were not performing well compared to other countries. The Trends in International Mathematics and Science Study (TIMSS) in 2007 included participation from thirty-six countries or educational

jurisdictions at grade four (Gonzales et al., 2008). The science portion of TIMSS was designed to broadly align science curricula in the participating countries with 53 percent of the questions being multiple choice and 47 percent constructed responses (Gonzales et al., 2008). The results were meant to reflect the science concepts and skills that had been taught in school and the cognitive skills students were expected to develop by grade four (Gonzales et al., 2008). TIMSS also collected background information on students, teachers, and schools to allow cross-national comparison of educational contexts that may be related to student achievement (Gonzales et al., 2008). In the United States, TIMSS was administered at 257 schools (a total of 10, 350 students) in grade four between April and June 2007 and included samples in both public and private schools, which were randomly selected and weighted to be representative of the nation (Gonzales et al., 2008). The TIMSS 2007 report indicated that science scores were statistically unchanged compared to the 1995 report for U.S. students in grades 4-8 (Gonzales et al., 2008). "Since 1995, TIMSS has been coordinated by the International Association for the Evaluation of Educational Achievement (IEA), an international organization of national research institutions and governmental research agencies." (Bybee, 2007, p. 44). Not only were these results discouraging but national organizations, such as the National Science Teacher's Association (NSTA, 2008), voiced their concern about these results as well.

> The National Science Teachers Association is discouraged by the results of the 2007 Trends in International Mathematics and Science Study (TIMSS). Science scores for both fourth and eighth grade students have remained flat since 1995 and scores for minority students are dismal (p. 1).

Although there seemed to be discontent with the United States' performance on the TIMSS report, scholars point to flaws in how the data were presented to the public. Bracey

(2007) argued that if scores was disaggregated based on ethnicity then, "White students compete well against those of students in the highest-ranking nations" (p.68). Bracey (2007) also argued that if scores were disaggregated based on poverty *(Poverty* was defined as an annual family income of less than half of the median family income in each country) "schools where 10% of the students live in poverty scored well above the highest scoring country, Sweden" (p. 68). Bracey (2007) pointed out that indeed other countries do have poverty but "not as many" as the U.S. One further argument that Bracey (2007) emphasized was the impact of ranking. He used the example of the 1995 TIMSS eighth-grade science results where U.S. students got 58% of the items correct "compared to an international average of 56%, and this score ranked them 19th among the 41 countries. Had they managed a mere 5% more correct, they would have soared to 5th; if they had scored 5% fewer correct, they would have plummeted to 30th" (p. 69).

Another international assessment that provided similar results to the TIMSS 2007 report was the Program for International Student Assessment (PISA) reports from 2006. Although the reports did not focus on elementary student achievement in science they did assess the science literacy of 15 year-old students in the U.S. along with 29 other countries world -wide. "PISA is sponsored by the Organization for Economic Cooperation and Development (OECD), an intergovernmental organization of 30 industrialized nations based in Paris, France" (Bybee, 2007, p. 42). "The PISA assessment measures student performance on a combined science literacy scale and on three science literacy subscales: identifying scientific issues, explaining phenomena scientifically, and using scientific evidence" (Baldi, Jin, Skemer, Green, & Herget, 2007, p.iii). The PISA was a two-hour assessment consisting of both short answer and multiple-choice questions (Baldi et al., 2007). The combined science literacy scores were reported on a scale from 0 to 1,000 with a mean set at 500 and a standard deviation of 10 (Baldi et al., 2007).

A total of 166 schools and 5,611 students from the United States participated in the assessment (Baldi et al., 2007). "The results showed that the average combined science literacy scale score for U.S. students was lower than the OECD average. U.S. students scored lower on science literacy than their peers in 16 of the other 29 OECD jurisdictions and 6 of the 27 non-OECD jurisdictions" (Baldi et al., 2007, p.4).

As with the TIMSS report the PISA also had critics. Lowell and Salzman (2007) suggested the PISA was flawed because one-third of the American sample was ninth grade or lower students whereas in Japan, Norway, and Korea close to all samples were collected from tenth grade students. The problem was that the OECD stated that one-year corresponds to about 41 points. Even though these other countries recorded higher scores than the United States Lowell and Salzman (2007) called into question how these average scores could be compared because of the grade level discrepancies. Lowell and Salzman (2007) also argued that there were differences in how countries excluded certain student populations. For example, Germany excluded special-needs students and this was estimated to affect their score by eight points. Lowell and Salzman (2007) noted that PISA cannot be used to infer issues of school quality because it fails to separate out influences of school, home, and community. Lowell and Salzman (2007) further argued "that today's American high school students actually test as well or better than students two decades ago" (p. 1). There is obvious disagreement among scholars over how our nation has been compared to other countries in terms of science achievement.

Other encouraging data describing how well students, especially in elementary grades, were achieving in science came from The National Assessment for Educational Progress (NAEP). NAEP is given to students in the United States about once every five years. In total, 44 states participated in 2005 and of these 37 States participated in both the 2000 and 2005

assessment years (Grigg, Lauko, & Brockway, 2006). In grade four the assessment was divided evenly to test students in each of the three science fields, earth, physical, and life science, where 45 percent of the assessment time was to be devoted to conceptual understanding, 45 percent to scientific investigation, and the remaining 10 percent to practical reasoning. The assessment was presented in two, 25-minute sections, in which students had to answer multiple choice and constructed-response questions. In each school where the assessment was given, one-half of the students received one of three hands-on tasks and related questions. The students who received these hands-on tasks received an additional 20 minutes to complete the assessment. In total, 8500 schools and 147,700 students participated nationally (Department of Education, 2005). Since 2000, the nation's fourth-graders have increased the overall average scale score by 4 points, a statistically significant gain (Grigg et al., 2006). At the state level, Georgia had higher overall gains from 2000 as well but 37 percent of students in Georgia who took the NAEP assessment scored below the basic level, 38 percent at the basic level (some knowledge and reasoning required for understanding the sciences at grade four level), 22 percent at the proficient level (knowledge and reasoning required for understanding sciences at grade four level), and only two percent at the advanced level (solid understanding of sciences as well as the ability to apply their understanding to practical situations at grade four level) (Grigg et al., 2006).

It is worth noting the achievement of elementary students today but compared to where they were several decades ago. The science portion of the NAEP has been administered since 1969 and very little change has occurred in the way it assesses students. Thus, scores can be compared across many years. The National Center for Education (NCES) (2000) reported that scores for 9 year olds declined in the 1970s but increased in the 1980s and early 1990s and have since decreased but remain higher than scores in the 1970s. It was beyond the scope of this

literature review to provide a complete synopsis of elementary student achievement across many decades but this example above was intended to at least summarize the longitudinal data reported from NAEP.

In light of some disagreements among scholars about the international reports, Bybee and Stage (2005) pointed out that "closing the achievement gap is a primary NCLB goal, and the international tests confirm that the gap is real" (p. 72). The combined tensions of NCLB and the international assessment scores definitely left science education with many questions. With concerns mounting, Goldston (2005) posed the following questions that seem to be as timely and apparent today as they were four years ago.

> With the social and political demand of "back to basics" accountability, fixed standards, and improved high-stakes test scores, what will be the long-term impact of the marginalization of elementary science in the nation's schools? What will happen to the momentum of educational reform aimed at inquiry-based pedagogy? What happens as the small reserve of future American scientists continues to diminish? Finally, what becomes of the goal of fostering a scientifically literate population? (p. 185).

As Goldston (2005) noted above, there is a conflict between the mandates of high stake testing by NCLB and calls from other national organizations, such as the National Research Council (NRC), the American Association for the Advancement of Science (AAAS), and the National Science Teachers Association (NSTA) for inquiry-based instruction. Over the past few decades inquiry-based instruction has become a large part of science education reform agendas and proposed work with prospective science educators (AAAS, 1993; NRC, 1996, 2000). The NRC (1996) describe inquiry teaching as those practices that promote the learning of scientific

concepts and processes as well as "how scientists study the natural world" (NRC, 1996, p. 23). *The National Science Education Standards* (1996) suggest that:

> Student inquiry in the science classroom encompasses a range of activities. Some activities provide a basis for observation, data collection, reflection, and analysis of first hand events and phenomena. Other activities encourage the critical analysis of secondary sources including media, books, and journals in a library (NRC, 1996, p. 33).

If science is viewed as inquiry, the "activities are more student-centered than teacher-centered and can be related to issues of student interest" (Eick & Reed, 2002, p. 402). The National Science Teachers Association echoed this sentiment and more specifically, what elementary teachers should be prepared to do in science instruction.

> Elementary teachers without a science specialization should be prepared to teach science with a strong emphasis on observation and description of events, manipulation of objects and systems, and identification of patterns in nature across subjects (NSTA, 2003, p. 6).

Reflecting on the comment Goldston (2005) made about preparation for high stakes tests and teaching science, as prescribed by national science education reforms, these two agendas conflict. Science educators and researchers want teachers to provide students with inquiry based science experience, but the looming significance of accountability hinders inquiry-based science or just science in general at the elementary level. According to Marx and Harris (2006) "the pressure of NCLB accountability, in which all students in grades 3–8 are assessed on language arts and mathematics annually, has led principals and teachers to direct time and resources toward language arts and mathematics, and, due to limited hours in the school year, to diminishing time for science" (p. 469). Obviously, tensions existed between what people wanted science to look like in the elementary classroom and the element of time in a given school day.

Before discussing where science teaching and learning are today in the elementary classroom, it is worth mentioning the STEM initiative. STEM stands for Science, Technology, Engineering, and Mathematics is receiving more attention in recent years because of efforts put in place under the *Deficit Reduction Act of 2005* (P.L. 109-171) to assess the success of federally funded education programs in the STEM disciplines (ACC, 2006). "This effort, carried out by the Academic Competitiveness Council (ACC) and led by Secretary of Education Margaret Spellings, laid the groundwork for sustained collaboration among STEM education programs across federal agencies that would greatly strengthen America's competitiveness" (p. 1). The statute charged the ACC to:

1. Identify all federal programs with a mathematics or science education focus;
2. Identify the effectiveness of those programs;
3. Determine areas of overlap or duplication among those programs;
4. Identify target populations served by such programs; and,
5. Recommend processes to efficiently integrate and coordinate those programs (p. 1).

The ACC inquiry covered 105 STEM federally funded programs for kindergarten through postgraduate education, with close to $3.12 billion in funding for the 2006 Fiscal Year. The ACC adopted the Hierarchy of Study Designs for Evaluating the Effectiveness of a STEM Educational Intervention, designed by the Coalition for Evidence-Based Policy, as its methodological framework for evaluating current and future federal STEM education investments (ACC, 2007). The hierarchy described three categories of evaluation design: experimental methods, quasi-experimental methods, and non-rigorous, preliminary reviews "such as those based on pre- and post-tests or self-reported outcomes" (ACC, 2007, p. 14). Several recommendations were made but one was of particular interest for science education at the elementary level. Recommendation

three from this report states, "federal agencies should improve the coordination of their K–12 STEM education programs with states and local school systems" (ACC, 2007, p. 2). A hearing was held on May 12, 2008 in the U.S. House of Representatives during the 110th Congress. The hearing statement provided a summary of the most recent concern over STEM education in the following passage.

> A consensus exists that improving science, technology, engineering, and mathematics (STEM) education throughout the Nation is a necessary, if not sufficient, condition for preserving our capacity for innovation and discovery and for ensuring U.S. economic strength and competitiveness in the international marketplace of the 21st century (p. 3).

There is an obvious call for change in STEM education in our nation. It seems that people at the federal level have a vested interest in improving the state of STEM education in our nation. At the state level, specifically where Magnolia State is located, there has also been a call to improve STEM education. The Board of Regents of the University System that serves Magnolia State (2008) announced that they would "establish a structured 'mini-grant' program for STEM and science and mathematics education faculty to collaborate in K-16 learning communities [and] all institutions that offer the associate or baccalaureate degree are eligible to participate" (p. 5). Some of these mini grants were awarded to other institutions in the same State to model Project FOCUS. Thus, STEM initiatives are not only being implemented at the national level but have a direct effect on the program that is central to this study.

Tensions Around Elementary Science Education

It is important to elucidate tensions central to facilitating meaningful science teaching and learning for elementary learners. The tensions that will be discussed are: the priority of science in elementary schools, teacher self-efficacy around science, alignment of state and national

standards, and other tensions related to school and student populations. Although there are other tensions important to facilitating meaningful science teaching and learning, the author chose to focus on tensions that seemed most important to the context of this study and had been thoroughly discussed by scholars in recent years. The author delimited the search for literature pertinent to this review by searching databases that were specific to educational research. From there, tensions discussed below seemed to adequately summarize the literature specific to elementary science education. Of course, other tensions exist but the author determined a select number to be the most important to the context of this study and seemingly were the most widely discussed in educational research.

Priority of science in elementary classrooms. One of the tensions in elementary science education today is amount of time dedicated to science instruction. Even though this study did not take place in a large metropolitan area, research that focused on urban elementary schools and science were pertinent because the schools in this study share characteristics with urban schools such as, diverse student populations, low-income children, and known struggles with meeting AYP. In Spillane, Diamond, Walker, Halverson, & Jitas' (2001) qualitative study of 13 Chicago elementary (K-8) schools' efforts to lead instructional change in mathematics, language arts, and science education, they suggested that, "accountability measures create considerable instructional pressure for teachers in urban schools where the gap is great between performance goals and students' actual performance" (p. 919). It is this pressure to focus on standardized assessments and improving performance in other subjects that leaves science out of schools' daily schedules. Even though there has been a consistent effort from the federal government, policy makers, and other national organizations to increase the awareness of the lack of science afforded to children in public schools, it does not replace the teacher and individual schools

commitments to accountability required by the federal government under NCLB (Marx & Harris, 2006). Spillane et al. (2001) provided an example of how a teacher in their study talked about why science was not a priority.

> We aren't able to teach science as much as I would like to, mainly because on the third grade level we aren't tested on [science and social studies], we're not tested on those subjects; we are tested on reading and math. . . . I just can't fit it in. It's so much math and so much reading that it's hard to fit the science and social studies. So most of the time . . . I began teaching science and social studies after the test (p. 923).

According to Spillane et al., teachers did not feel science was a priority because other subjects were deemed more important for students' future academic success and testing purposes. Diamond and Spillane (2004) found similar results from their study in four urban elementary schools, two high-performing and two low performing, "to examine how schools respond to high-stakes accountability policies" (p. 1145). Data for their study were collected via interviews with teachers and school leaders and observations of school leadership events, school meetings, and classroom instruction. They found that across both high and low-performing schools, language arts and mathematics were emphasized over science in response to testing and accountability policies. They also found that if science was taught at all, it was usually after testing had been completed for the year. Even though some of the schools were high performing in terms of standardized testing their study indicated that it didn't matter; schools across the board were not emphasizing science. Similar results were found in a study conducted by the National Institute of Child Health and Human Development (2005). From this large-scale study of third-grade classrooms the researchers reported that only six percent of instructional time was devoted to science whereas 56 percent and 29 percent were devoted to literacy and mathematics,

respectively. Marx and Harris (2006) argued that the pressure of NCLB accountability, "has led principals and teachers to direct time and resources toward language arts and mathematics, and, due to limited hours in the school year, to diminishing time for science" (p. 469).

Spillane et al. (2001) asserted that even prior to the inception of NCLB elementary science was considered an undervalued school subject. In the large study "2000 National Survey Of Science And Mathematics Education: Status of Elementary Science Teaching", reported by Fulp (2002), it was found that in 2000, "grade K–5 self-contained classes spent an average of 25 minutes each day in science instruction, compared to 114 minutes on reading/language arts, 53 minutes in mathematics, and 23 minutes in social studies (p. 11). Despite the historic efforts to reform science education it has remained one of the most neglected subjects in the elementary school curriculum (Sivertsen, Riley, Robinson, & Conaty, 1993). Because research suggests that science has received less time in elementary classrooms compared to other school subjects it is worth exploring other tensions that may contribute to the lack of time given to science in the elementary classroom.

Teachers' self-efficacy in science. Self-efficacy has been used in many areas of education research but Bandura's (1997) model has been widely used in science education because of its utility in research on science education and teacher education (Mulholland & Wallace, 2001). Bandura (1997) defined perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). In other words, it is a person's beliefs about what they can achieve under particular circumstances. The research on elementary science self-efficacy aligns with reasons why elementary teachers may allocate less time to science and more time to other subjects. Ramey-Gassert (1994) found that elementary teachers with the lowest self -efficacy in science spent less time teaching science and were more

likely to use text-based instruction instead of hands-on approaches. The "2000 National Survey Of The State Of Science And Mathematics Education" (Weiss, Banilower, Mc-Mahon, & Smith, 2001) revealed that only 25% of the elementary teachers surveyed viewed themselves as very well qualified to teach science. Thus, there is a potential link between how teachers view their own abilities in science, the time they choose to spend teaching it in their elementary classrooms, and the type of instruction they use. Ramey-Gassert, Shroyer, and Staver (1996) used the Science Teacher Efficacy Beliefs (STEBI) instrument developed by Riggs and Enochs (1990) and found what they call "antecedent" factors that impacted self-efficacy. These factors included science experience in and outside of school, science teacher preparation, and science teaching experience. Enochs, Scharmann, and Riggs (1995) also suggested similar results in their examination of 73 pre-service elementary teachers' sense of self-efficacy. Specifically they asked the following two questions:

1. Do prospective elementary teachers' efficacy beliefs relate to their beliefs concerning classroom management and control?
2. How is a measure of self-efficacy related to prospective teachers' self-reported choice concerning the teaching of science, amount of time spent in performing "hands-on" science, and/or perceived effectiveness as future elementary science teachers? (p. 65).

Enochs et al. (1995) used the STEBI-B (Enochs & Riggs, 1990) and the Pupil Control Ideology (PCI) (Willower, Eidell, & Hoy, 1973) instruments and performed a series of correlations to answer the above research questions. Enochs et al. (1995) found significant correlations among science teaching self-efficacy, the number of science courses taken, instructional practice, and perceived teaching effectiveness. These findings pertain to another important point about

elementary teachers' self-efficacy around science—student achievement. In the previous discussion of the status of elementary science education the concern over student achievement in science was revealed. Saklofske, Michayluk, and Randhawa (1988) suggested that teachers' belief in their instructional efficacy is a very strong predictor of academic attainment in young children. Thus, it can be furthered argued that high self-efficacy in science for classroom teachers is not only beneficial for themselves, but impacts student achievement as well.

The previous section of the literature review focused on examining studies about practicing elementary teachers, but it is also important to discuss pre-service teachers and some of the tensions that relate to their self -efficacy and beliefs about science teaching and learning. This area of literature was important to explore because even though practicing teachers were participants in this study their experiences with science in their own education were also examined. Czerniak and Schriver (1994) found that pre service elementary teachers who had the lowest levels of teaching self -efficacy also tended to be concerned about their own understanding of science. Plourde (2002) examined the impact of the student teaching semester on 59 pre-service elementary teachers' personal efficacy and outcome expectancy beliefs in science teaching. The Science Teaching Efficacy Beliefs Instrument (STEBI-B) was used to gather quantitative data to determine the personal science teaching efficacy and science teaching outcome expectancy for each participant. The research question was, "what is the impact of the student teaching semester on pre-service elementary teachers' personal efficacy beliefs and outcome expectancy beliefs in science teaching?" The results indicated that the student teaching semester did not influence the participants' sense of personal teaching efficacy; however, there was a significant negative change in participants' outcome expectancy scores. Plourde (2002) suggested that during the student teaching experience one factor that could have accounted for

this negative perception may have developed because of lack of good role models during their field placement because practicing teachers, as suggested in previous sections, have challenges associated with science, and at times, avoid teaching it. In Bryan's (2003) case study of one pre-service teacher's beliefs about science teaching, the elementary education pre-service teacher felt that "elementary science was not treated as a priority compared with most other subjects in the classroom where she was a student teacher" (p. 842). It seemed that a tension existed in not only the self-efficacy of teaching science for practicing elementary teachers but pre-service teachers as well. To understand reasons behind the tensions of the priority of science in the classroom and teacher self-efficacy, it was important to examine not only the amount of science teachers were exposed to in their undergraduate coursework, but also professional development opportunities.

Preparation. Another tension in elementary science education is teachers' preparation in science, and by extension, opportunities for professional development. According to the *2000 National survey of science and mathematics education: Status of elementary science teaching,* a large majority, 86 percent of elementary teachers have majors in education and only 4 percent have degrees in science or science education (Fulp, 2002). This seemed typical in that elementary teachers, as has already been discussed, do not feel science is one of their strong subjects and it is less frequently taught. In the same report, it was found that forty percent of elementary teachers take four or fewer semesters of science coursework (Fulp, 2002). The lack of science coursework might not be a point of contention if teachers felt prepared to teach science, but that is not the case. It has been suggested by many scholars that few elementary teachers are prepared academically to teach science effectively (Cerniak & Lumpe, 1996; King, Shumow, & Lietz, 2001). In a large-scale study less than one-third of elementary teachers reported feeling well qualified to teach science but 77 percent indicated they were well qualified

to teach reading/language arts, 66 percent to teach mathematics, and 52 percent to teach social studies (Fulp, 2002). There seems to be a reasonable link that can be developed between science not being a priority in elementary schools today and the teacher's lack of preparedness and feelings of qualifications surrounding science education.

Professional development. When elementary teachers become practitioners their professional development in science may not be as frequent as in other subjects (Fulp, 2002). Elementary school science teachers, like other science teachers, generally report low levels of participation in professional development specific to science teaching (Weiss, Banilower, McMahon, & Smith, 2001), but do see a need for it to deepen their own science content knowledge (Fulp, 2002). In a large-scale study conducted by Fulp (2002) it was reported that of the 665 elementary teachers surveyed, three quarters of them had 15 or fewer hours of science-related professional development in the previous three years (Fulp, 2002). According to Fulp (2002), "the workshop is the most common form of professional development (58 percent of elementary school science teachers have attended one in the previous three years), followed by collaborating with teachers locally, either observing their classrooms (33 percent) or meeting regularly to discuss science teaching (27 percent)" (p. 9). A closer look at the data indicated that 58 percent of elementary teachers had not taken a college/university science course since 1990, and 49 percent have not taken either a science course or a course on how to teach science since 1990 (Fulp, 2002). Thus, there are indications that elementary teachers are not receiving much continued education in science but do view it as a need for their own learning of science.

There appears to be a tension behind the lack of professional development opportunities afforded to elementary teachers in science, but what about when these kinds of learning experiences were made available? A case study conducted by King et al. (2001) focused on four

elementary teachers to determine their perspectives on science teaching. The authors conducted classroom observations of science teaching practices and interviewed the teachers. A finding from the study pointed to teachers, who despite having participated in staff development aimed at the promotion of inquiry-based science instruction, did not translate this type of instruction into their own classroom practices. They suggested that teachers may not have translated inquiry based teaching practices from the staff development back to the classroom because it was not a long term experience for the teachers. King et al. (2001) explained that, "it is not likely that an occasional afternoon workshop will have a long-term impact on classroom practice" (p. 106). There are many scholars who believe that teacher professional development should be embedded in the daily classroom routine (Cochran-Smith & Lytle, 1999) and offer on going and systematic opportunities for teachers to engage around issues that affect student learning (Darling-Hammond, 1998). For professional development in science education, Loucks-Horsley et al. (2003) argued that it should not only be long term and embedded in classroom practices but also needs to have a strong connection to student learning. Loucks-Horsley et al. also argued that professional development in science needs to enhance the pedagogical and content knowledge of teachers. The authors stated that, "there is something more to professional development for science and mathematics teachers than generic professional development opportunities are able to offer" (Loucks-Horsley et al., 2003, p. xxvi). Marx & Harris (2006) argued that years of research has shown that teachers need many hours over several years to acquire the skills they need to teach science effectively, especially inquiry based instruction. These authors believe that currently the United States does not have the infrastructure to "deliver nationwide the amount of professional development that will be required to scale up the kinds of findings that we report in our work" (Marx & Harris, 2006, p. 471). Smith and Southerland (2007) also agreed that

elementary teachers need professional development in science that is not only long term but also engages them in learning about the descriptions of reform in national reform documents. They suggested that teachers needed "to work through the implications of these reforms for their own teaching practices" (Smith & Southerland, 200, p. 417).

Tension between national standards and high stakes assessment. A tension that has risen out of the combined efforts of the national science standards and NCLB is alignment and achievement. Marx and Harris (2006) expressed a concern for how schools tend to forget about supporting science inquiry as stated in the national science standards in light of preparing students for high stakes tests. They noted, "test preparation in the era of NCLB is a high priority, especially in low-performing schools that are under intense pressure to show immediate improvement on test scores" (p. 471). Under NCLB, States are responsible for developing their own set of standards and creating assessments to measure student achievement in accordance with the standards. As Marx and Harris (2006) explained, "inherent in this process is a loose coupling between national and state standards (p. 469). With this in mind scholars have examined how standards in science at the state and national level are used in classroom practices. In the large scale study reported by Fulp (2002) interesting results emerged related to teacher implementation of the national standards. According to Fulp, "teachers appeared well prepared in several general pedagogical practices, with 80 percent or more reporting themselves as being well prepared to:

1. Listen/ask questions as students work in order to gauge their understanding;
2. Teach groups that are heterogeneous in ability;
3. Have students work in cooperative learning groups; and
4. Manage a class of students engaged in hands-on/project-based work (p. 6).

By contrast, Fulp emphasized that, "only between 63-77 percent of the elementary teachers surveyed rated themselves as well prepared to implement the following practices aligned with the national standards:

1. Make connections between science and other disciplines;

2. Develop students' conceptual understanding of science;

3. Take students' prior understanding into account when planning curriculum and instruction;

4. Lead a class of students using investigative strategies; and

5. Provide deeper coverage of fewer science concepts (p. 7).

In a study focused on the impact of reform efforts on elementary teachers' beliefs, Smith and Southerland (2007) found that "although the emphasis in science education at the national level focuses on a vision of reform, conversations with teachers at the local level indicated that many were unaware of the scope of the organized national effort to change the way science is taught" (p. 405). They also suggested that teachers believed the state standards incorporated the national standards as reflected in the comments of one participant teacher who said,

> I think that teachers depend on the state to include everything we need in the Core. And I know they have tried to take all the national stuff and make it what they really want. So, I haven't really worried about national standards too much (p. 415).

Although the teacher believed that the state standards did take into account the national standards for science education, Marx and Harris (2006) noted that, "there are no national frameworks for developing science assessments and no stipulation in NCLB that States measure deep understanding as called for in national standards" (p. 469). Thus, there seems to be a tension

created between what the national standards want to see happen in elementary science and what States may actually dictate and assess.

Tension of meeting AYP. Much of the discussion in this chapter thus far has focused on the affects of NCLB on science instruction in the elementary classroom but NCLB also has affects on the larger school culture as well. Because FOCUS takes place in some low-income and diverse schools the literature on the affects of NCLB and the pressures of making AYP for such schools were pertinent to discuss here. Under the NCLB law, performance is defined by "annual measurable objectives" (AMO). AMO indicates the minimum percentage of students who must meet the proficiency level of performance on reading and mathematics assessments. Also, the AMO separated school children into subgroups. These subgroups are students who are economically disadvantaged, from major racial and ethnic groups, disabled, and limited English proficient. NCLB required 95% of students overall and 95% of each subgroup of students within a school to take the standardized reading and mathematics tests. Each State established its own AMO targets and a minimum group size-that is, the minimum percentage of students in each subgroup who are required to meet or exceed the AMO targets (NCLB, 2001 Sec. 1111 [b] [2] [G] [iii]). Kim and Sunderman (2005) conducted a study that used “school-level data from six geographically diverse States with different school accountability policies [to examine] how the AYP requirements affect high-poverty schools with significant Black and Latino enrollments” (p. 4). They found that in their survey, 75% of California schools that had one or two subgroups reported to achieve AYP, but only 25% of schools that had six subgroups to report achieved AYP. In this same study, using data from Virginia from 1998-2003, Kim and Sunderman reported that for both reading and mathematics schools meeting AYP produced no more growth on average as compared to needs improvements schools. Kim and Sunderman (2005) concluded

that differences were only apparent in terms of where the students started, not in how much success the teachers had with respect to achieving student learning. Marx and Harris (2006) pointed out that, "one of the problems is that in schools that start lower, relatively more students must achieve proficiency in order to meet AYP" (p. 472). Kim and Sunderman (2005) concluded that the "analysis of the NCLB accountability system in six geographically diverse states showed that the use of mean proficiency had a disparate impact on schools serving low-income children and subgroup accountability rules over-identified racially diverse schools as failing to make AYP" (p. 10). The results of these studies seemed to suggest that, accountability measurements of NCLB may not be the best way of assessing student achievement. The question is, how does this impact science education in elementary schools, specifically schools that have many subgroups they have to consider to achieve AYP?

Lee and Luykx (2005) have conducted research for over a decade in the same low-income and ethnically diverse school district. They suggested that in light of the pressures of NCLB and elementary schools making AYP, science curriculum needed to be highly integrated with language arts and mathematics. As science education researchers, they had to find a way to sustain work within these schools. According to Lee and Luykx (2005), "most instructional time in the participating elementary schools [was] devoted to teaching reading, writing, and mathematics, which factor[ed] into school accountability [and] this emphasis was especially evident in low-performing schools, which operated under the threat of state takeover in the event of persistent 'failing' school grades" (p. 422). Similarly, Fulp's (2002) report suggested that "elementary students frequently read about science during class, especially those in the upper elementary grades and that activities considered more traditional in nature, reading in class and the use of textbook or worksheet questions" (p. 15). Marx and Harris (2006) suggested that for

new and established standards-based science curriculum designs to make it to the elementary classroom during the era of NCLB it may be that these curricula will have to be integrated with language arts and mathematics.

Another tension associated with elementary science education in the context of NCLB, is related to school administration issues. As noted previously, Lee and Luykx (2005) emphasized the need to find ways to integrate their science curriculum into other subjects for it to be accepted by principals and teachers. Lee and Luykx (2005) also reported that in a school district in which they worked, some elementary principals told teachers not to teach subjects that were not included on accountability measures, two to three months prior to statewide testing. Principals were in positions to decide what should be taught in their school but, as has been discussed throughout this section, accountability measures were putting pressure on schools and thus principals to achieve in reading and mathematics, sometimes leaving little time for science instruction. Sunderman and Kim (2005) argued that principals have the ability to "refocus accountability by using test results for diagnostic purposes and ensuring that testing activities did not take excessive time away from the basic activities of teaching and learning, distort the curriculum, or devalue other important learning goals" (p. 24).

Resources. Because FOCUS took place in schools where in 2007-2008, three of the five schools reported more than 90 percent of their students as receiving free and reduced lunch and three were designated as Title 1 schools (Governor's Office of Student Achievement, 2007), it is appropriate here to briefly discuss how resources for science in elementary schools may affect classroom practice. The author is not suggesting that schools where FOCUS takes place or other schools that have a high percentage of low-income students all suffer from a lack of resources. The author's intent is to provide a summary of some of the research about resources since it is a

tension for some schools that share characteristics of some of the schools that participated in FOCUS. Statistical data describing urban school systems in the U.S. cite lacking resources as an impediment to effectively teach and serve the large number of low-income and highly mobile students at these schools (Committee for Research on the Education of Students Placed at Risk, 1996). A study conducted by King et al. (2001) revealed that teachers in urban elementary classrooms believed in an inquiry based approach to science, as delineated in national and state standards, but were unable to actualize their own views about the best instructional practices because of lack of resources. In the paper "Science Education In An Urban Elementary School: Case Studies Of Teacher Beliefs And Classroom Practices", King et al. (2001) concluded that teachers perceived three barriers that "prevented them from being the best possible science teachers" (p. 107). Two were pertinent to this discussion:

1. Need for additional classroom materials
2. Need for extra adult help in the classroom during "hands-on" investigations (p. 107).

A second grade teacher in their study "noted that she needed more classroom materials and more help from adult volunteers to engage in the "hands-on" investigations that she believes are most appropriate for teaching science (King et al., 2001, p. 96). Although this is one teacher's perception of her need for resources for science, all four teachers who participated in King et al.'s study, wished they had someone else in the classroom to assist them on the days they did hands-on activities. They felt that because of the nature of hands-on, inquiry based instruction they could not, as just one teacher, facilitate the lesson so that all children were actually learning and taking part in the lesson.

Final Note

This chapter has focused on the state of elementary science achievement in the United Sates and tensions related to science teaching and learning. It is apparent that NCLB and accountability has had a substantial impact on elementary science education and classroom practices. Yerrick, Parke, & Nugent (1997) argued more than ten years ago that reform efforts in science education needed to focus on collaboration. They argued that,

> Finally, we petition schools, government agencies, researchers, teacher educators, and teachers to work together on making the necessary changes in science teaching reform. Accountability is an essential component of schooling but mandates cannot promote necessary changes. Real dilemmas exist in schools for teachers when they must make difficult choices and their jobs' and their students' needs are not met. Only functional and effective collaborations of organizations can result in real reform (p. 156).

This call for collaboration seems just as timely today as it was in 1997. The question still remains: how do schools, government agencies, researchers, teacher educators, and teachers collaborate to improve science education in the elementary classroom?

Theoretical Framework

Introduction

This study builds on theoretical understandings of (a) communities of practice, which serves as a context for examining university/school collaborations, (b) situated learning theory, and (c) discourse, which is the medium through which stakeholders negotiated FOCUS. The notion of communities of practice was important to this study because it allowed the researcher to consider how stakeholders came to FOCUS with existing ways of viewing the world and ways of acting in it. Situated learning theory helped bring clarity to the ways in which communities of practice, enacted by stakeholders, included different forms of FOCUS participation. The role of discourse was important because the goal was not only to understand how stakeholders participated in FOCUS but the processes of negotiation they were involved in throughout the experience. Discourse was used as a way to understand the deeper context of the commitments stakeholders brought to the experience.

Communities of Practice

Lave and Wenger (1991) described a community of practice as "a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice" (p. 98). They used the notion of communities of practice to explore how people engaged in activities associated with a particular organization, group, or way of belonging. According to Lave and Wenger, a community of practice did not necessarily have to be a formal designation; it represented the commonalities and nuances of a group and its members. Within a given community of practice, members may have had different viewpoints, interests, and contribution levels but participants shared concerns about what they were doing and what that meant to them individually and for their communities (Lave & Wenger, 1991).

Also, people were members of many different communities of practice and these may have changed over the course of their lives; they are not viewed as unchanging or closed (Wenger, 1998).

Membership in a community of practice implies commitments (Wenger, 1998), which are aspects of social life that make communities cohere (Farley, 1986). Thus, in a community of practice, commitments can be thought of as a way to distinguish members from others (Wenger, 1998). The idea of commitments was important to this study in terms of understanding the communities of practice to which participants or stakeholders belonged and how they shaped the experiences they had in FOCUS. Because communities of practice involve membership, the term stakeholder was used to designate those involved in the numerous communities of practice that surrounded FOCUS. The FOCUS experience contained locations of possibilities where stakeholders could become part of the community of practice of elementary science and reflect on their other communities of practice.

The theory behind communities of practice, although originally defined by Lave and Wegner (1991), was developed further in Wenger's (1998) book, *Communities of Practice*. Many scholars have used variations of the ideas behind community of practice in their work. Sergiovanni (1994) applied the theory of community, developed by Tönnies (1957), to schools and the development of school communities. Sergiovanni (1994) argued that schools needed to be thought of as communities instead of formal organizations. When schools are viewed as formal organizations Sergiovanni (1994) argued that, "relationships are constructed for us by others and become codified into a system of hierarchies, roles and role expectations" (p. 4). On the other hand, if schools are thought of as communities instead of relying on "external control measures [they] rely more on norms, purposes, values, professional socialization, collegiality,

and natural interdependence" (p. 4). Sergiovanni (1994) used this argument to develop a definition of a professional community in schools. He defined a professional community as one in which "members make a commitment to the continuous development of their expertise and to the ideas of professional virtues" (p. 71).

Barth (1990) used the notion of community to argue that schools are viewed as limited to places where children learn and teachers teach but they should be viewed as a community of learners and leaders. According to Barth (1990) a community of learners is a "place where students and adults alike are engaged as active learners in matters of special importance to them and where everyone is thereby encouraging everyone else's learning (p. 9). A community of leaders is where all stakeholders in the school, students, teachers, parents, and administrators share the responsibility and opportunity to make decisions that affect the entire school (Barth, 1990). Barth (2001) used the idea of community to talk about how school based reform needed to view the school as a community of leaders and learners where teachers and administrators could find ways to reflect on their work and develop a "culture' of learning and reform in schools while at the same time promote student learning.

The authors discussed above limited their scope to the community of schools, but because this study was set in a university-school collaboration it was important to gain insight into how community, or terms related to community, have been used in types of settings where institutions work together. Although it has been recognized that community did have an important place in this study and theoretical framework, other terms have been used to describe community and its application to university-school collaborations. Clark (1992) argued that although the term "network" has attributes of collaborative efforts between schools and universities, and has been widely used by scholars, the way researchers have used it do not align with what Clark denotes

as a partnership. Clark (1992) argued that networks do not constitute a partnership because they are not "a deliberately designed, collaborative arrangement between different institutions working together to advance self-interests and solve common problems" (p. 37).

Many studies have used Lave and Wenger's (1991) community of practice construct to conceptualize new ways of forming groups within and outside of formal educational settings. Because FOCUS is an existing community of practice the term is used here, to consider how all parts of the community of practice of FOCUS inform each other and the larger program context. Now that it has been explained why Wenger's (1998) notion of communities of practice was applicable to this study a more in depth summary of how it was used in this study will be explored.

Before the notion of communities of practice and how it was used in this study is further explored, justification for its use as a guiding framework instead of culture, identity, or service-learning will be discussed.

Raymond Williams (1963) denoted culture as one of the two or three most complicated words in the English language. Although many definitions of culture exist, Giddens, Duneier, and Appelbaum (2007) defined it "as the values the members of a given group hold, the languages they speak, the symbols they revere, and the norms they follow" (p. 56). According to Hofstede (1997) culture is the sum of total of the learned behavior of a group of people that are generally considered to be the tradition of that people and are transmitted from generation to generation. If the author had chosen to examine the cultures of the participants the study would have not only considered the communities of practice that were important to the FOCUS context but all their communities of practice that contribute to how they enact their culture and how they

would carry this culture from generation to generation. In order to understand culture one has to examine many different aspects of a person's life not just in the particular context of FOCUS.

Identity was another way in which the author could have framed this study. According to Wenger (1998), "identity exists – not as an object in and of itself – but in the constant work of negotiating the self" (p. 151). Although identity may have seemed relevant to this study, this work was not meant to solely examine individual participants and their personal identities. This study examined the larger communities of practice to which these individuals belonged to and how they were important to the processes of negotiation and the larger FOCUS context.

Many definitions of service-learning exist but a concise summary comes from Hatcher and Bringle (1997):

> We view service-learning as a credit-bearing educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of the course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility (p. 153).

Although FOCUS has many aspects of the above fore mentioned definition of service-learning the author did not choose to use this term because of its implications associated with students being involved in enhancing their learning and civic responsibility. If the author had chosen to look at this study through a service-learning perspective the content knowledge and civic engagement would have needed to be examined in much greater detail and this would have changed the scope of the study.

Wenger (1998) described the notion of communities of practice as based on a social theory of learning. Wenger summarized what participation means for a community of practice with the following:

> Participation here refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities. (p. 4).

Wenger noted that participation is not just a sense of belonging to a group but also "a kind of action" (p. 4). His social theory of learning includes four interconnected components:

1) Meaning: a way of talking about our (changing) ability—individually and collectively—to experience our life and the world.
2) Practice: a way of talking about the shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action.
3) Community: a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognizable as competence.
4) Identity: a way of talking about how learning changes who we are and creates personal histories of becoming in the context of our communities (p. 5).

Of these four components, practice and community were particularly important for this study. Practice was used to frame how stakeholders engaged in activities that surrounded FOCUS. Practice is a way to talk about how a community of practice coheres through mutual engagement (Wenger, 1998). Together, the teachers and FOCUS students engaged in classroom practices that allowed them to share ways of doing things with each other. The classroom

teachers and FOCUS students came to FOCUS with existing communities of practice as teachers and science students respectively. These existing communities of practice, as well as the larger FOCUS context, informed the practices they engaged in together. The notion of community was important to the study because it provided a way to think about how stakeholders brought certain competences with them to the FOCUS experience but ultimately had to negotiate them together through interactions, talk, and thus participation.

Although communities of practice are discussed in this study in terms of a university-school collaboration, they are not limited to formal academic settings. At times, communities of practice can be so informal "that they rarely come into explicit focus, but for the same reasons they are quite familiar" (Wenger, 1998, p. 7). Wenger (1998) argues that his use of community of practice encompasses both practical and theoretical notions. Wenger (1998) states that "we all have our own theories and ways of understanding the world, and our communities of practice are places where we develop, negotiate, and share them (p. 48). The notion that communities of practice involve not just participation by stakeholders, but also negotiation, was important to this study. Negotiation, in the context of communities of practice, was used as a way to understand how stakeholders engaged in practices together and developed ways of addressing issues associated with the FOCUS experience. Negotiation and the importance of it to this study will be further discussed in later sections.

Wenger (1998) described three levels of participation: the individual, communities, and organizations. These levels of participation represented how stakeholders in FOCUS had varying degrees of involvement and contributed to the community of practice of FOCUS in different ways, but all were important. These levels of participation proved to be useful in understanding how stakeholders contributed to and influenced the community of practice of FOCUS.

According to Wenger, participation for individuals "means that learning is an issue of engaging in and contributing to the practices of their communities" (p. 7). Thus, in this study, it was important to understand how stakeholders engaged in daily classroom practices and how this engagement informed their existing and developing communities of practice. It was outside the scope of this study to describe all the communities of practice to which stakeholders belonged. However, it was evident that classroom teachers and FOCUS students belonged to many different communities of practice.

The communities in this study included not only classrooms but also the larger context of the elementary schools, the university, and the wider communities in which these entities exist. If this study had been limited in scope to only include the classroom teachers and FOCUS students it would have lacked valuable information about how other stakeholders contributed to the negotiation process. All stakeholders played an important role in the community of practice that encompassed FOCUS. Even though the principals, graduate student coordinator, and program developer were not directly participating in classroom activities and thus negotiation they were still informative participants in the community.

The third level of Wenger's (1998) participation level is the organization. In this study Project FOCUS was considered the organization; it was the link between the classroom teachers and elementary schools to the university science students and the collegiate institution. Project FOCUS combined the communities of practice of the individuals and communities because it was a university-school collaboration. If instances of negotiation between the classroom teachers and FOCUS students were isolated from the larger context of FOCUS the study would have been valuable only at the classroom level. Instead, by examining all levels of the community of

practice of FOCUS the productive and unintended outcomes associated with negotiation were revealed.

Situated Learning Theory

Because FOCUS students and their partner teachers participated in FOCUS together, it was important to consider how individual and collective practices shaped the negotiation of FOCUS. Legitimate peripheral participation, which is a central aspect of situated learning theory, is a process by which people become part of a community of practice by engaging in the practices of a community (Lave & Wenger, 1991). Stakeholders came to the FOCUS experience with existing communities of practice. Because an understanding of how they became a part of other communities of practice was important to this study, the ideas behind situated learning theory and legitimate peripheral participation were needed. Situated learning emphasizes how the whole person participates in activities in the world and with the world (Lave & Wenger, 1991). The individual stakeholder was viewed as a whole person not removed from the world he/she negotiated inside and outside of the FOCUS experience. Thus, legitimate peripheral participation in FOCUS was open to the influence of other communities of practice.

Legitimate peripheral participation leads to full but not complete participation in a community of practice. "Complete participation would suggest a closed domain of knowledge or collective practice for which there might be measurable degrees of 'acquisition' by newcomers" (Lave & Wenger, 1991, p. 36). Instead, peripheral participation leads to full participation. Members new to the community are granted peripheral membership, which changes to full membership as they develop legitimacy and expertise through contributing to the work of the collective (Wenger, 1998). According to Lave and Wenger, "full participation is intended to do justice to the diversity of relations involved in varying forms of community membership" (p. 37).

Legitimate peripheral participation was relevant to this study because it allowed the researcher to consider not only the way the individual stakeholders negotiated their roles but how the communities of practice, with which they were engaged, informed this negotiation. Thus, the notion of legitimate peripheral participation was not limited to the individual but included all levels of participation. All stakeholders, at all levels of practice, contributed to the community of practice of FOCUS. There were different levels of involvement and contributions that were made by stakeholders but all played a role in the development of the community of practice of FOCUS.

A final point about different levels of communities of practice was how they were related to degrees of involvement in the FOCUS experience. The different levels of involvement were viewed as directly connected to the different levels of practice discussed above. In the same way, stakeholders in FOCUS were at different layers of the core. In the middle were the classroom teachers, FOCUS students, and elementary students (the elementary students were important stakeholders and part of the community of practice of FOCUS but were not participants in this study). They were the most engaged and immediate to the community of practice of FOCUS and involved most in the actual instances of negotiation. A layer outside was the school principals and elementary school community that observed the classroom teachers and FOCUS students in action. The principals and thus elementary school level would be considered at the periphery of the community of practice. Wenger, McDermott, and Snyder (2002) noted that, "a large portion of community members are peripheral and rarely participate. Instead, they keep to the sidelines, watching the interaction of the core and active members" (p. 56). Even though they were not directly involved in the negotiation processes inside the classroom they were still influential in how the experience with the community of practice of FOCUS unfolded. A layer outside of that

was the larger organizational practice of FOCUS which included the university. The university was at the periphery, but gained access to the lessons learned by the FOCUS students through their talk about classroom experiences in reflection sessions every week, and from the observations the graduate coordinator conducted in the classroom. All these layers contributed to the larger FOCUS experience but it was worth recognizing there were distinct layers of influence but all afforded learning opportunities.

Negotiation

Situated learning theory (Lave & Wenger, 1991) and Wenger's (1998) community of practice provided a guiding framework for exploring how stakeholders negotiated FOCUS. According to Lave and Wenger (1991), knowledge relies on not only the present context of meaning but how it is situated within the renegotiation of meaning of the past and future. The different stakeholders participating in FOCUS belonged to various communities of practice but these were not independent of their commitments and thus had the potential to be negotiated through FOCUS. As well, stakeholders came to the FOCUS experience with goals and expectations that may have changed as they participated. Embedded within this experience were their communities of practice, commitments, Discourses, and both intended and unintended outcomes. All were important and part of the situated learning context of FOCUS, which was inseparable from the larger social context. Because the social context was an important component of the FOCUS experience and thus, communities of practice, establishing a way to connect these pieces was important.

Cobb, McClain, Lamberg, and Dean (2003) developed an approach that enabled them to look at the interconnections different communities of practice have within a given setting. This approach focused on

> (a) boundary encounters in which members of different communities engage in activities together, (b) the role of *brokers* who are at least peripheral members of two or more communities, and (c) the role of boundary objects that have been incorporated into the practices of two or more communities (p. 13-14).

Cobb et al., (2003) suggested that the communities of practice that stakeholders or brokers belong to became connected when individuals engaged in activities together. This notion of brokering or crossing boundaries was important as it allowed the researcher to consider not only the ways in which stakeholders belonged to communities of practice outside of FOCUS but how boundary crossing and brokering may have been inhibited or prohibited boundaries during the processes of negotiation. Wenger (1998) also used brokering when describing how communities of practice come together. He stated that, "brokering is a common feature of the relation of communities of practice with the outside. Brokers are able to make new connections across communities of practice, enable coordination, and –if they are good brokers—open new possibilities for meaning" (p. 109). In the same way Wenger (1998) used the notion of boundaries in discussing practice and it was an important concept in this study.

> Crossing boundaries between practices exposes our experience to different forms of engagement, different enterprise with different definitions of what matters […]. By creating tensions between experience and competence, crossing boundaries is a process by which learning is potentially enhanced, and potentially impaired (p. 140).

It is likely that this is what stakeholders in FOCUS may have experienced. As they engaged in activities together they may have had to negotiate the boundaries that surrounded their different communities of practice. This type of negotiation resulted from what Wenger (1998) calls boundary encounters. "If a boundary encounter […] becomes established and provides an

ongoing forum for mutual engagement, then a practice is likely to start emerging" (p. 114). Thus, through the FOCUS experience stakeholders were likely to encounter boundaries because they came from different communities of practice. It was the negotiation of these boundaries that allowed for a new community of practice to form around FOCUS.

Negotiation through Discourse

Wenger's (1998) view of negotiation was used to understand the process by which stakeholders negotiated FOCUS. As Wenger explained, if negotiation is placed in the context of practice and meaning then it is used "to convey a flavor of continuous interaction, of gradual achievement, and of give and take" (p. 53). In this study the idea of negotiation was not only used to represent how stakeholders participated in this "active process of producing meaning" (p. 53) but as a way to understand how this process was influenced by discourse. Discourse was an important piece to consider because it was a medium through which ideas were negotiated. Because the perspective on negotiation suggested by Wenger (1998) was used, discourse was not limited to just words but how they influenced the actions and interactions among stakeholders. James Gee (1999) discusses discourse in a way that reaches beyond just the words themselves to look at how they are connected to social settings. Gee's framework for (1999) discourse analysis will be explained in greater detail in the methodology section, but it is important here to discuss how his theory of discourse informed the way negotiation was used in this study. Gee's (1999) approach to discourse "seeks to balance talk about the mind, talk about interaction and activities, and talk about society and institutions" (p. 5). This theory argues that, "language has meaning only in and through practice" (p. 8). Thus, this theory became important when thinking about how communities of practice were developed in the context of FOCUS. Gee (1999) defined this language in use as "Big D" Discourses that included not only the spoken words but how they

were used in action. Gee (1999) used "little d" discourse to represent the notion of language in use but argued that only studying the spoken words, the "little d", limits our knowledge of understanding the enactment of them in social situations. Although, the "little d" discourses were important and helped the researcher use Gee's (199) discourse analysis to make sense of the data, the "Big D" Discourses were informative when placing this study in a theoretical context. The assumption behind the "Big D" Discourse is that there is reflexivity between language and reality or the situation of interest. Gee (199) argued that they are not separate and that "language simultaneously reflects reality (the way things are) and constructs it to be a certain way" (p. 82). Thus, when one thinks about negotiations that happen through Discourse one can not only consider the tangible elements of words but the place, people, and context through which they occur. The FOCUS experience provided locations of possibilities for those involved to have Discourse and live through the experience.

Summary of Overall Argument for Theoretical Constructs and Their Use in this Study

The three constructs used most frequently in this study were communities of practice, Discourse, and commitments. In the theoretical section above there was a brief mention of commitments but they were important in this study. The construct needs justification here because it did impact the way communities of practice and Discourses were used throughout the rest of this document and study. Commitments were used to describe the more tangible evidence of the communities of practice stakeholders possessed upon entering the FOCUS experience. Thus, these commitments constituted a large part of how they talked about their existing communities of practice and how these commitments were eventually negotiated through the FOCUS experience. Discourses represented the larger picture and may be in less obvious ways how people talked and acted through their existing commitments. When stakeholders explained

their existing commitments the researcher looked beyond just the spoken words to reveal what larger Discourses their commitments encompassed. For example, teachers talked about their commitments to children's learning but also their commitments to doing well on standardized tests. The principals talked about their commitment to children's learning but also their commitment for their school to do well on standardized tests. Thus, these stakeholders talked about their commitments to learning and testing and from these commitments a Discourse of accountability was revealed. They may have not directly talked about accountability but it was important and informed their commitments of learning and testing.

Chapter Three: Methods

This study was conducted to examine how collaborative efforts between a university and elementary schools contributed to science teaching and learning. Additionally, it was designed to elucidate the impact university science students had on elementary science learners and teachers, shed light on ways to revise Project FOCUS to ensure its continued success, and inform the development of similar collaborations.

Key Terms

The key constructs that framed this research included the following: stakeholders, commitments, communities of practice, negotiation, and productive and unintended outcomes. All constructs informed this study in terms of how the data were analyzed and the important links between the research questions, analysis, and theoretical framework.

The *stakeholders* were the adult participants in Project FOCUS. Specifically, the stakeholders for this study were the classroom teachers, university FOCUS students, the graduate assistant, program developers, and school principals. This study specifically examined how the university FOCUS students and partner teachers negotiated FOCUS, although insights gleaned from other stakeholders were important as well. The stakeholders may have had different investments in the program, but all were important when negotiating FOCUS.

Individual stakeholders came to FOCUS with their own views on what they wanted to gain from the experience and what they would contribute. Through negotiating the FOCUS experience the stakeholders revealed their *commitments*. For example, FOCUS students may have come to the experience with commitments to share science with elementary children

whereas the partner teachers may have viewed it as a way to meet certain standards. Commitments can be thought of here as the ties that bind people together in a community. “They may be critical to the success of a community or desirable for promoting harmonious relationships” (Farley, 1986). Thus, the stakeholders came to FOCUS with established commitments from their respective communities that bonded them together. Recognizing preexisting commitments illuminated the impact they had on the negotiation process in FOCUS.

Stakeholders belonged to various *communities of practice*, which included the places, people, and events that shaped their view of the world and how they acted in it. Communities of practice had an important link to commitments in that stakeholders came to FOCUS with existing communities of practice. These communities of practice always included commitments. For example, FOCUS students may have talked about their participation in the community of practice of a college student, whereas partner teachers may have talked about their role as an educator. The commitments stakeholders brought to FOCUS through their existing communities of practice were meaningful because the goal was to understand how they eventually negotiated FOCUS. Communities of practice became apparent as participants revealed their commitments via talk and writing during the FOCUS experience. Stakeholders belonged to communities of practice that extended beyond the classroom, Project FOCUS, and academia in general, and they brought commitments associated with these communities of practice to their negotiation. The idea of communities of practice was useful because it helped one understand what the stakeholders viewed as important, what they were committed to and whether those communities changed or aided in the negotiation of FOCUS. Indicators of stakeholders’ commitments were evident in the way they wrote or talked about their role as teacher, student, citizen, agent, nurturer.

Stakeholders interacted with each other within and between communities of practice. As people interacted between communities of practice they continuously engaged in a 'give and take' with respect to diverse motivations and commitments. For the purpose of this study, the nature of this give and take constituted *negotiation*. According to Wenger (1998), if negotiation is placed in the context of practice and meaning then it is used "to convey a flavor of continuous interaction, of gradual achievement, and of give and take" (p. 53). Negotiation was an ongoing process that extended beyond the immediate experience and continued to influence the stakeholders' goals and participation in communities of practice beyond Project FOCUS.

Productive and unintended outcomes were what came from the negotiation of FOCUS by the stakeholders through their existing and newly emerged communities of practice. Productive outcomes were results of the negotiation process. These results could be viewed as either positive or negative but all were important in the attempt to understand what learning experiences occurred. What did stakeholders experience in the process that was productive? Unintended outcomes were results stakeholders or researchers did not foresee through the negotiation process.

Methodological Framework

Discourse Analysis

James Gee's (1999) discourse analysis was used to guide the methodical framework of this study. This framework aligns with situated learning theory and communities of practice. In situated learning theory, language constitutes a piece of practice, and it is through practice that people learn (Lave & Wenger, 1991). Gee views language as practice that is integrated with social situations and interactions. In both situated learning theory and Gee's discourse analysis framework, the social world outside of a particular context or situation is central to the learning

process. Gee (1999) summarized the importance of knowing how words do not come without history. In the same way, stakeholders in this study brought ways of talking and acting based on events of the past. Gee (1999) stated that,

> Words have histories. They have been in other people's mouths and on other people's pens. They have circulated through other Discourses and within other institutions. They have been part of specific historical events and episodes. Words bring with them as potential situated meanings all the situated meanings they have picked up in history and in other settings and Discourses" (Gee, 1999, p. 54)

Gee labeled his theory of discourse analysis as "language in use." He summarized this theory in the following way: "We continually and actively build and rebuild our worlds not just through language, but through language used in tandem with actions, interactions, non-linguistic symbol systems, objects, tools, technologies, and distinctive ways of thinking, valuing, feeling, and believing" (Gee, 1999, p. 11). It is the building and rebuilding of language as an active state that allowed FOCUS to be negotiated.

Big D Discourse

Gee's (1999) approach to discourse analysis, which he referred to as Discourse with a capital "D", asks questions about how language is used to communicate and influence meaning in different settings. This approach considers more than spoken or written language; it involves the actions, non-language symbols, and political and/or ideological influences that constitute language in the social world. This methodological framework was used in this study to understand negotiation of FOCUS it was important to consider what stakeholders said and wrote as well as how aspects of the social world impacted their language. Thus, a discourse analysis that looked beyond the written text was important. Communities of practice, previously

discussed in the theoretical framework, are associated with the big "D" discourse, including socially-situated commitments. Characteristics of the Discourses that come from communities of practice include:

1. ways of performing and recognizing characteristic identities and activities;
2. ways of coordinating and getting coordinated by other people, things, tools, technologies, symbol systems, places, and times; and
3. characteristic ways of acting-interacting-feeling-emoting-valuing-gesturing-posturing-dressing-thinking-believing-knowing-speaking-listening (and, in some Discourses, reading-and-writing, as well). (p. 38).

Discourse analysis focuses on how any one or all of these characteristics are displayed in any piece of spoken or written language (Gee, 1999). It focuses on how people communicate their interpretation of events through language as well as convey their social positions within those events (Gee, 1999). Thus, the existing communities of practice stakeholders had when they began FOCUS were reinterpreted as they moved through the experience. This reinterpretation was based on how stakeholders enacted the characteristics Gee (1999) provided, through the experience.

There are multiple dimensions of language that must be analyzed when working from a language in use perspective, including spoken and written discourse as well as positions, relations, and ideologies conveyed via discourse. Positions can be defined as the role language plays in how stakeholders represented themselves in various social situations. For example, how stakeholders talked about how they saw themselves in FOCUS was representative of a position that may have been conveyed via discourse. Relations can be defined as how stakeholders talked about how they not only saw themselves in FOCUS but how other people and events shaped this

perspective. As stakeholders developed discourses around relations there were underlying ideologies informing their words. McLaren (1998) defines ideologies as the way one views the world through social practices and rituals in which they participate.

Within the context of positions, relations, and ideologies Gee provides building tasks or the pieces of language that help construct meaning for the speaker and listener, writer and reader as a way to organize and describe the way stakeholders negotiated FOCUS. Gee explained how language people use displays particular situated meanings by assembling building tasks. For this study, analysis began by looking across the spoken and written discourse and then moving to using building tasks to guide further analysis and eventual interpretation. Each building task had accompanying questions that assisted the researcher in making sense of the data. Gee's original questions under the building tasks were modified to represent questions relevant to this study.

Participant Selection, Description of Participants, Setting, and Study Design

Participants were purposefully selected based on their prior experience with the program, their interest in teaching, and/or their school placement. Primary participants in this study were four FOCUS students and their respective partner teachers in the program. The first two pairs were chosen because they had previously worked together in Project FOCUS. The third pair was chosen because the FOCUS student indicated an interest in teaching on her FOCUS application. She was paired with a teacher who had also agreed to participate in the study. The remaining pair was selected based on school location. Because the first and second pairs were at the same school, and the third at the other, one more pair was needed. Thus, the remaining pair was chosen based on school placement. The school placement was important because, one of the schools, Evergreen Elementary, was where Project FOCUS was initiated and had a long-standing tradition of being a "science school". The other site, Cedar Elementary, was the newest to the

program, had a high percentage of low-income students, and was in a rebuilding process due to concerns over how former administrators handled school funds. The diverse school contexts were useful in looking at how these unique individuals and partnerships negotiated the FOCUS experience rather than making generalizations across the group. Before the participant and school placements are discussed further background information on FOCUS will be provided.

Background Information on FOCUS

The FOCUS students attend a mandatory orientation at the beginning of the semester. This orientation is typically held at one of the partner elementary schools. At orientation students engage in hands-on activities that model the type of lessons they should create for use in their elementary classrooms. They also have the opportunity to walk through the elementary school, typically talk with one of the existing FOCUS teachers, and ask questions that remain before they begin working in their respective classroom the following week.

The first week of the course is designed for the FOCUS students to schedule a time to meet with their partner teacher to discuss topics related to the specific classroom, go over classroom rules, talk about expectations for the semester, and at times, begin to outline the lessons that will be taught for the rest of the semester. In addition the FOCUS student has to observe the classroom for at least two hours that week before commencing teaching the following week. In the second week, the FOCUS students start teaching science. In total, the students spend three hours in the classroom per week, which equates to 40 contact hours over the course of the 13 weeks of the semester (excluding university breaks).

The elementary teachers that participate in FOCUS are asked to evaluate the FOCUS students three times throughout the semester. The graduate coordinator typically e-mails the designated evaluation form to the teachers a week before evaluations are due to remind them

they need to be completed. The teachers are supposed to be mindful that these are not elementary education majors, but college science students who typically have no or very little experience in working in elementary classrooms. The evaluation form allows teachers to critique the student on appropriate dress, timeliness to the classroom, and if the lesson was organized and hands-on in nature.

Towards the end of the semester the FOCUS students submit and present a lesson, their "Best Lesson", during a reflection session. Students have to submit a written version of the lesson they feel was successful during the semester. They are asked to align the lesson with the state science standards for the grade they are working in and present it to the other students in their reflection session. Also, FOCUS students are asked to be critical of the lesson in terms of commenting on things they would modify to meet the learning needs of the elementary students. These lessons are then placed on the Project FOCUS website with the intent that future FOCUS students will utilize this resource as well as elementary teachers.

The FOCUS students and classroom teacher pairs at Evergreen Elementary

Ann was a veteran FOCUS student who was at the time of the study participating in FOCUS for the fourth consecutive semester. She was a senior, biological science major who hoped to enter dental school the following fall. During her junior year she transferred to the university from another large university outside of the state and immediately began participating in FOCUS. She was introduced to FOCUS by her academic advisor at this university and decided it would be a fun experience to work with children in the community and share her love of science with others. She was placed with a first grade teacher, Ms. Smith, at Evergreen Elementary. Ms. Smith had participated in FOCUS since its inception in 2002. Ms. Smith had been teaching elementary school for close to 30 years and had always taught in the primary

grades. She always welcomed FOCUS students and felt the program was a great success in her classroom. Ann would take small groups of children outside the classroom to do science on the FOCUS days while Ms. Smith worked with the other children back in the classroom.

The other FOCUS student who participated in this study and at Evergreen Elementary was Angela. Angela was participating in FOCUS for the second time. She was a sophomore Animal and Dairy Science major with ambitions of going to veterinary school upon graduation. Angela really enjoyed science inside and outside of the classroom and wanted to participate in FOCUS to share her passion of science with young students. She worked in Ms. Hart's fifth grade classroom at Evergreen. Ms. Hart was a first year teacher although she had been a para-professional in a first grade classroom in the same school the previous year. Ms. Hart decided to participate in FOCUS based on her experiences observing the FOCUS student in the first grade classroom she had worked in and that teacher's excitement about the program. Ms. Hart had always envisioned herself going into teaching from a young age and was very happy that she was teaching fifth grade; she felt she was not only teaching the children but learning as well.

The FOCUS students and classroom teacher pairs at Cedar Elementary

Ruth was a senior biological science major who planned to attend Physician Assistant (PA) school after graduation. She entered college wanting to go to medical school but she eventually decided to go the PA route because of her grade in a particular class, her interest in pediatrics, and her desire to eventually have a family. She heard about FOCUS through her roommate, an early childhood education major, and decided to participate in it her last semester as an alternative to a lecture class. She wanted to share her passion of science with children. Ruth worked at Cedar Elementary with Ms. Vail in a second grade classroom. This was Ms. Vail's second time participating in FOCUS and first year teaching second grade. She had previously

taught special education for several years in the same school and then made the transition to general education just a few years ago. She wanted to participate in FOCUS because of the praises other teachers had voiced about the program and her desire to have some help with science instruction.

Kelly was a sophomore biological science major and had declared that she was pre-med but was thinking about other career routes before participating in FOCUS. She chose to participate to see if teaching was something she should consider as a career. She did not want to be in school for another six years past her undergraduate studies and having a family was an expressed interest of hers as well; thus she was considering teaching as a potential option. She worked with Ms. Roberts in a kindergarten classroom at Cedar Elementary. Ms. Roberts was a second career teacher that had been teaching kindergarten for the past five years at Cedar. Her main motivation for having a FOCUS student was simply to have another person in the room and to help with science instruction.

The secondary participants in this study were a) the researcher, a former graduate coordinator of the FOCUS program; b) the program developer; and c) school principals. Here again, a brief description of the graduate coordinator, program developer and, principals are provided. Their roles in FOCUS are further discussed in the analyses chapters.

Because the researcher was also a former graduate coordinator of FOCUS her experience in the program and reflections on the research process were valuable. She was the graduate coordinator for a year and a half. During the semester in which the study was conducted she was still the graduate coordinator and thus had the responsibilities assumed of the position in addition to the research agenda. With this position she was in charge of placing the 60 FOCUS students with 60 classroom teachers in the five participating elementary schools. She also observed the

FOCUS students while they were teaching throughout the semester, led reflection sessions with them each week, and graded and responded to weekly reflective journals they submitted. Another part of her position, that did not happen very often, was to assist in any problems the FOCUS student and/or classroom teacher were having in their partnership.

The program developer, Dr. Wilson, provided useful information about the history of FOCUS and his goals for the program. Because he had a large role in initiating the program in 2002 he saw the program grow from having only one FOCUS school, Evergreen Elementary, to five schools in the local community. Although he allowed the graduate coordinator to maintain the daily operations of the program he attended reflection sessions regularly to listen to what the FOCUS students were experiencing in the elementary classroom. Thus, his insight into how the program had developed over time, and his visions for it for the future were very important to this study.

The principals provided information about the role of FOCUS in their respective schools. Mr. Pearce was the principal at Evergreen Elementary, the first school that accepted the FOCUS program in 2002. Mr. Pearce was actually the assistant principal in 2002 but had since assumed the position of principal. Dr. Hahn was the principal at Cedar Elementary. Cedar was the newest school to the FOCUS program, beginning its participation in the Spring 2007. Dr. Hahn was previously a principal at a local middle school but felt her services were needed at Cedar because of problems the school had experienced in recent years. A more in depth summary of how each principal viewed FOCUS in the context of their respective schools is provided in later analyses chapters.

Study Design

To explore how stakeholders negotiated FOCUS using Gee's (1999) discourse analysis, it was necessary to use various data collection methods often referred to as methodological triangulation (Figure 2). Mathison (1988) suggests that triangulation is a strategy that provides evidence for the researcher to make sense of a social phenomenon, but it does not, in and of itself, do this. Triangulation does not assume that multiple sources of data will complement each other and make for an easy argument; it recognizes the places where data are inconsistent and even contradictory (Mathison, 1988). In the same way this view of triangulation was a way to make sense of the phenomenon of FOCUS but did not assume it would assist in merging data into a "neat" package. Mathison (1988) also argues that although triangulation allows the researcher to collect various forms of data this does not eliminate bias that is present in any type of data collection. His argument applied to this study. It was not possible to eliminate all subjectivities the researcher brought to the study, in terms of data collection and analysis. Thus, triangulation helped with the collection of a variety of data sources to build a representation of how stakeholders negotiated FOCUS.

Data Collection

The following served as primary data sources: student, teacher, principal, and program developer interviews, and journal entries written by FOCUS students. Secondary data sources included field notes from observations of classroom activities, field notes from student and teacher planning and debriefing meetings, e-mail communication between the FOCUS students and teachers, and the researcher's journal. Below is a summary of what and when data sources were collected and further explanations of why certain data sources were collected. In particular, the researcher:

1. Conducted three individual interviews with all FOCUS student and teacher participants. Three individual interviews (approximately 60-90 minutes) were conducted: one prior to the FOCUS students beginning their work in the classroom or within the first week of beginning the program, in the middle of the semester, and at the end of the semester.
2. Conducted two group interviews (60-90 minutes) with each of the respective FOCUS student and partner teacher pairs. These interviews were staggered between the three individual interviews.
3. Conducted one individual interview with each school principal. The individual interview was conducted towards the end of the semester.
4. Conducted one individual interview with the program developer. The individual interview was conducted towards the end the semester.
5. Observed the classroom teacher and FOCUS student in their classroom interactions at various times throughout the semester (approximately 10 times per pair) and kept detailed field notes of these interactions.
6. Observed the classroom teacher and FOCUS student in their formal discussions about lesson planning and other topics at various times throughout the semester and kept field notes of these conversations.
7. Collected FOCUS students' semi-structured reflective journals on a weekly basis.
8. Kept a researcher's journal to document important decisions made throughout the duration of the study.

Primary Participant Data Collection

The individual interviews were helpful in exploring stakeholders' commitments through the experience. The group interviews, student and teacher debriefing and planning meetings, and

classroom observations, and e-mails between the FOCUS students and teachers were helpful in exploring how stakeholders negotiated their commitments and communities of practice. The journals allowed the researcher to tap into how the FOCUS students interpreted their experience and elucidated some points of how they negotiated FOCUS with their respective partner teacher. The study took place according to the following timeline (Figure 1). In January 2008, FOCUS students and their partner teachers were selected to participate in the study (participant selection discussed in previous section). There were individual interviews with all student and teacher participants at the beginning, middle, and end of the spring 2008 semester (see Appendix A for interview questions). The group interviews took place in between the first and second and second and third individual interviews (see Appendix B for interview questions). From Janurary 2008-May 2008 student participants wrote journal reflections (see Appendix C for journal prompts) which were also part of the course requirements. Some of these journal entries were semi-structured while others were free writes and were typcially one to two pages double spaced. In January 2008 individual interview # 1 and group interview # 1 took place. The first individual interviews conducted with the FOCUS students and classroom teachers were used to gain background information concerning their experiences with science, decision to become a science student or elementary teacher, reasons for pariticpating in FOCUS, and other pertinent information as it came up in conversations. At this time the researcher began classroom observations of the FOCUS students and teachers and also listened to conversations they had about their plans for the next lesson. The classroom observations were valauble because the researcher was able to view how the classroom structure operated while the FOCUS student was present and observe the dynamics between the FOCUS student and classroom teacher. The observations also provided questions to ask in future interviews about what they were doing in

science, their choices for particular lessons, and other dynamics observed between the FOCUS student and classroom teacher. Initially, the researcher wanted to capture their conversations about lesson planning through audio recording but the reality of these conversations limited her ability to do so. For example, the classroom teacher and FOCUS student usually only spoke about the next lesson at the very end of their time together, if at all, and would usaully just say, "I will e-mail you". There was more discussion of lesson plans for future dates via e-mail. The e-mail conversations between the FOCUS student and classroom teacher were another piece of data that ultimately replaced the infrequent in-person conversations they had throughout the semester. In March 2008 individual interview # 2 took place. In this interview the focus was more on the participants' perceptions of their roles in the classroom. There was also discussion of testing because from the first individual interview this seemed to be a topic that needed further exploration and was impacting the FOCUS experience for all participants. In late April and early May 2008 individual interview # 3 and group interview # 2 took place. The last individual interview allowed the researcher to embed in-interview member checking as she took time in this interview to summarize themes gleamed from the previous two interviews and asked participants, "is this a correct statement of your experience?", "is this what you mean by …", "am I understanding what you said correctly?". This interview allowed the researcher to explore stakeholders' overall feelings about their FOCUS experience and the effect the program, if any, had on their views of science teaching and learning. The two group interviews conducted with the FOCUS student and teacher pairs were helpful in the sense that many times they reiterated things they had said in individual interviews. This allowed for further insight into the partnerships and activities of negotiation that were happening in the classroom setting. The

individual interviews were a much better gauge of how the individual participants viewed their roles in the FOCUS experience and a more honest account of their experience as a whole.

Secondary Participant Data Collection

The data collection for the secondary participants consisted of one individual interview with the two school principals and the program developer. The individual interviews (see Appendix D for interview questions) conducted with the school principals allowed the researcher to gain insight into the motivations they had for their school participating in FOCUS, their views on the state of science education in elementary schools today, and their views on the function of FOCUS within their particular school context. The intent of the interview was to assist in understanding the larger context for which FOCUS resides beyond the elementary classroom. With the same intent the program developer was interviewed (see Appendix D for interview questions) to develop an even larger context for FOCUS and gain first hand knowledge about the development of Project FOCUS and the motivations for starting it.

Data Analysis

Each interview was transcribed verbatim. Brackets were inserted wherever there was laughter, pauses, sighs, etc. not necessarily for analysis, but as a reminder to the researcher of the tone of the conversation between her and the research participants. The researcher transcribed the interviews, which was a first step in becoming familiar with the data and seeing patterns and themes emerge.

The analysis began with an initial screening of transcripts, journal entries, and field notes to identify preliminary themes in the data. This screening process entailed reading through all the interviews, making notes on the margins, and then creating vignettes that represented what the researcher perceived was happening, in terms of negotiation between participants. The screening

process also helped to elucidate the stakeholders' commitments and communities of practice. Even though these vignettes were a very preliminary part of the analysis they were helpful in starting to think about the data and how to use Gee's (1999) discourse analysis described above.

After constructing vignettes, more in depth analytical notes were taken about the data and were used to guide the next step, looking for episodes across the data. Episodes were pieces in the data that represented meaningful events that related to the research questions. For example, meaningful events included, how stakeholders talked and wrote about their motivations for participating in FOCUS, their established communities of practice, stories about their own science experiences, experiences they had while in the program, etc. Categories of episodes (or identified major themes in the episodes) were then formed and organized into a separate document as they were found. Examples of episodes that were in the data were: talk of past experience in science, talk of participation in FOCUS, talk of career choice (teacher, physician), talk of their roles in FOCUS as they saw them, the affects of testing on science instruction, etc. The episodes were color-coded and compiled into separate files so the researcher could go back and forth between the data and the episode list. The compiled list of episodes and where they were found in the original data helped the researcher become familiar with the data to use Gee's (1999) building tasks and questions that were earlier discussed.

Portraits were created of participants to help the author and readers become familiar with the communities of practice they belonged to and how these ultimately informed their negotiation of FOCUS. As discussed in prior sections, understanding the communities of practice stakeholders came to the experience with helped the researcher understand how, what, and why they negotiated the FOCUS experience in the way they did. It was also important for readers to know not only how stakeholders were situated within the FOCUS experience but also know

where stakeholders came from, their experience with science, and life experiences that added to their negotiation while participating in FOCUS.

To construct the portraits, Gee's (1999) socioculturally-situated identity task was used to ask questions about participants' past and present experiences. More specifically, the portraits were guided by asking: "What relationships and identities (role, positions) with their personal, social, and cultural knowledge and beliefs (cognition), feelings (affect), and values, seem to be relevant to the situation?" (Gee, 1999, p. 93). For example, the participants' stories of their experience with science, learning, and teaching were used to create these portraits. Particular phrases that were very important in thinking about how these portraits represented the communities of practice stakeholders were situated within and how they ultimately informed their negotiations in the classroom were highlighted. Although these portraits offered insight into teacher and student communities of practice, they were not complete descriptions. These portraits served to familiarize the readers with who the participants were and how past experiences, specifically with science, shaped their negotiations of FOCUS. There were other ways in which the participants' communities of practice became apparent in their processes of negotiation thus, these portraits were not inclusive of everything that shaped their communities of practice but highlighted who the participants were and what they may have brought to the negotiation of FOCUS.

After the classroom teacher and university student portraits were constructed, the activity and connection building tasks were used to further analyze the data and the relationship building task to form preliminary interpretations about the data that would lead into conclusions for the study. Gee provides questions to accompany these building tasks. The questions listed, and

elaboration of how they were used in this analysis below, have been modified from Gee's (1999) original list to fit the needs of this study.

Activity Building refers to "using cues or clues to assemble situated meanings about what activity or activities are going on, composed of what specific actions"(p. 86).

1. What is the larger or main activity (or set of activities) going on in the FOCUS experience?
2. What sub-activities compose the negotiation? What actions (down to the level of things like "requests for reasons") compose these sub-activities and activities?

The entire FOCUS experience was the main activity in the study. Although, participants were also involved in sub-activities such as classroom activities, planning, and reflection sessions. The talk or writing associated with these activities was examined across episodes to see if there were patterns in how stakeholders talked or wrote about the activities that comprised the FOCUS experience. Also considered were how stakeholders represented their motivations and communities of practice through the FOCUS activities. Once the important activities and sub-activities in the negotiation of FOCUS were established Gee's (1999) connection building task was used.

Connection Building refers to "using cues or clues to make assumptions about how the past and future of an interaction, verbally and nonverbally, are connected to the present moment and to each other—after all, interactions always have some degree of continuous coherence" (p. 86).

1. What connections are made within and across utterances and large stretches of the interactions stakeholders have (for example, personal experience or connections in science) looking backward and/or forward?
2. What connections are made to events and people outside the current experience?

Using the connection building task, episodes where stakeholders talked and wrote about their motivations for being in FOCUS and how the communities of practice as university students and classroom teachers informed the negotiation that was going on in the classroom setting were examined. The connection task helped the researcher think about how stakeholders talked and wrote about their motivations for being in FOCUS across time and ascertain if they were consistent over the semester. This building task also allowed the researcher to ask questions about the episodes when stakeholders talked and wrote about the communities of practice they belonged to and ascertain whether they talked and wrote about them in the same way throughout the semester. For example, from first formulating the activities of negotiation through the activity building task the researcher was then able to think about how the communities of practice of stakeholders, the setting in which FOCUS occurred, and the other people and decisions outside of the immediate classroom environment informed the negotiation that happened between the classroom teacher and FOCUS student pairs. The activity and connection building tasks were used to examine the data themselves to come to a point where the relationship building task could be used to make inferences about the data.

Relationship Building refers to "using cues or clues to assemble situated meanings about what identities and relationships are relevant to the interaction, with their concomitant attitudes, values, ways of feeling, ways of knowing and believing, as well as ways of acting and interacting" (p. 86).

1. What relationship and identities (roles, positions), with their concomitant personal, social, and cultural knowledge and beliefs (cognition), feelings (affect), and values, seem to be relevant for stakeholders to negotiate the FOCUS experience?
2. How are these relationships and identities stabilized or transformed?

3. In terms of identities, activities, and relationships, what Discourses are relevant (and irrelevant) in negotiating? How are they made relevant (and irrelevant), and in what ways?

Under this task the researcher began to ask questions about what happened to the motivations stakeholders had for the experience. What could be attributed to changes in the motivation if they occurred? Was this reliant on episodes where FOCUS student and partner teacher interacted or did this happen on an individual basis? Also, what happened to the commitments or communities of practice the stakeholders had when they came to the experience? What can be attributed to changes in the commitments or communities of practice? This is where the researcher made inferences about how stakeholders' motivations and commitments informed each other and began to overlap to produce the outcomes of the FOCUS experience. Some examples of inferences that could have been made through this process were: FOCUS students may have had a higher appreciation for teaching, they may have seen themselves in the role of teacher, they may have realized they were good at teaching, or decided that teaching was a good contingency plan if they didn't get into medical school. With respect to the teachers, they may have talked about adding more science into the classroom lessons, finding new meaning in science learning, or wanting to continue participation in the program. All these inferences were tied back to how the stakeholders negotiated FOCUS and the process they went through to revise their own ideas about FOCUS and their experience.

The relationship-building task was also used to help the author consider Discourses that were important to the activities of negotiation. The question was asked of what "Discourses are relevant (and irrelevant) in negotiating? How are they made relevant (and irrelevant), and in what ways?" So how does one identify a Discourse? Discourses were identified from the other

ways in which the stakeholders talked about their commitments and roles in FOCUS because they were not limited only to talk but were observed by the researcher as influencing the way in which the community of practice of FOCUS was formed and negotiated. It was the relationship building task that allowed the researcher to not only consider the ways in which stakeholders talked through the processes of negotiation but how their words were carried out in action. In particular, the author used the word trust to denote a particular Discourse in this study. It is worth clarifying that in later chapters where Discourses are discussed in the context of this study the author did not intend to delve into all the ways scholars define and talk about trust as a theoretical construct. The intent was to use trust as a practical term to represent how certain stakeholders valued FOCUS to the extent they did not question the impact it had on their own communities of practice and that of others.

In addition, the relationship building task and world building tasks were used to build the larger context of the FOCUS experience. The relationship building task was used not only to look at how the main stakeholders of this study, the classroom teachers and FOCUS students, enacted negotiation activities in the classroom but how other stakeholders contributed important Discourses to the entire FOCUS experience. The relationship building task was used to move from solely looking at how the classroom teachers and FOCUS students enacted negotiation activities in the classroom to viewing the FOCUS experience as containing other stakeholders that were not physically in the classrooms but influenced the experience for all parties involved.

In light of using discourse analysis and understanding the levels of negotiation between the classroom teachers and FOCUS students, the larger school context in which this program operated and the origins of the program needed to be included. Here, Gee's (1999) world building task questions were used simultaneously with the relationship building task questions

mentioned above, to guide analysis and representation of the school context through the lens of the principals and the larger FOCUS context through the lens of the program developer. The school and thus principals at the schools participating in FOCUS were integral to how stakeholders negotiated their roles, commitments, and existing and changing communities of practice. The world building task was used to ask questions about what situated meanings of what the principals said about their school seemed important for FOCUS. What situated meanings and values seemed to be attached to places, times, teachers, and the school system were relevant to the FOCUS experience? What institutions and/or Discourses were being (re-produced) in the FOCUS experience and how were they being stabilized or transformed in the act? Gee (1999) defines situated meanings as an important aspect of word meaning. He (1999) states that, "we humans recognize certain patterns in our experience of the world. These patterns […] constitute one of the many situated meanings of a word […]" (p. 42). In the same way the principals and program developer were involved in the FOCUS experience and recognized patterns of how FOCUS affected their teachers, students, and larger school system. The principals and program developer recognized patterns of how the FOCUS experience was carried out in their school and university setting and their role in this experience. As Gee noted, "we recognize or assemble situated meanings based on context, but we also construe the context to be a certain way and not another based on the situated meanings we assemble" (1999, p. 47). In the same way, the principals were influenced by the context of the school system. This context informed how they talked about Project FOCUS and their ideas about Project FOCUS informed how they talked about the school system, especially in terms of standardized testing and the importance of science education for their elementary students. Similar to the school principals, the program developer was surrounded by the university system context and thus situated

meanings that were constructed from this institution influenced the way he talked about Project FOCUS. Thus, the world building task questions were used together with the underlining idea of situated meaning, in discussing how the principals and program developer situated FOCUS within the larger school, university, and community context.

Researcher's role

What is the researcher's relationship with the participants? The researcher was the graduate assistant for Project FOCUS for three semesters, which afforded her the opportunity to meet weekly with the FOCUS students, read journal entries, and respond with comments and feedback. She also had the opportunity to engage in conversations with many partner teachers and at the minimum had contact with the teachers via e-mail or when observing FOCUS students in the classroom. This relationship with the participants from Project FOCUS facilitated productive conversations and access to the setting but also, as she conducted the research, it made her more aware of how science and science instruction were viewed in the elementary schools the study was conducted. It was not that the schools did not care about science but, because of factors discussed in later chapters, the schools did not make science a priority. In addition, her role as the graduate assistant may have played a role in what they shared. They may have talked and wrote about the FOCUS experience in a way that they felt aligned with their perceptions of her beliefs about the purpose and goals of FOCUS. To dissuade participants from potentially answering how they "thought" they should answer she gave them opportunities to reflect on questions that seemed important to them to fully explore instead of immediately moving through a list of interview questions. Hopefully, her willingness to listen to participants' ideas fostered a comfortable space for all; that was the intent. In addition to the analysis of the data, participants were asked to member check to increase the viability of the interpretation. This

was done while the interviews were conducted as well as through e-mail communication after the study was completed. She also participated in a research group where she was able to discuss findings with other graduate students in her department, who were practicing teachers and knowledgeable about Project FOCUS. The most important form of member checking came through the interview process where the researcher followed up participants' answers to questions with interpretations of their answer. She tried to do this throughout the entire interview process to ensure that participants' words, views, and ideas were used and not hers, as researcher and graduate coordinator of Project FOCUS.

Chapter Four: Discourses

Preview of Chapter Four, Five, and Six

Chapter four describes discourses of the program developer, the former graduate assistant for FOCUS, and the school principals. These discourses were important in terms of understanding the broader FOCUS context. Chapter five describes the participants and the broader FOCUS context. First portraits are presented of the classroom teachers and FOCUS student participants. These portraits introduce the main stakeholders in this study, describe the participants' background, experiences with science in their own education, and other pertinent information about who these participants are and what shapes their experiences with FOCUS. Additionally, the portraits describe the communities of practice and commitments the classroom teachers and FOCUS students bring to the FOCUS experience. As described in the methods chapter, understanding the communities of practice and commitments the participants brought to the FOCUS experience informed how they acted in and talked about the activities of negotiation that took place in the classroom setting. Again, this section builds on Gee's (1999) connection and relationship building tasks. The following research questions were addressed: "what were the commitments stakeholders brought to the FOCUS experience?" and "why did stakeholders choose to participate in FOCUS?" The reasons why the classroom teachers and FOCUS students chose to participate are described to give readers an idea of their motivations to participate. In Chapter six, scenarios are used to depict how negotiation between the classroom teachers and their respective FOCUS students were carried out during the FOCUS experience. One scenario for each of the five negotiation activities was developed to represent how the specific FOCUS student/teacher pair negotiated the given activity and were also compared

and contrasted across the pairs. In addition, the scenarios were meant to assist in answering research question two, "in what ways do stakeholders from various communities of practice negotiate FOCUS?" (Table 1 provides a synthesis of how the data analysis for each teacher/FOCUS student pair was organized throughout chapters five and six). The final portion of chapter six ties all the abovementioned chapters of analyses together. Here themes are drawn out that were relevant to the entire context of the study and are discussed individually. This section reveals themes situated within the communities of practice associated with the larger FOCUS context that will be helpful to answer the research question of, "what are the productive and unintended outcomes of negotiating the FOCUS experience?" which will be further discussed in the discussion and conclusions chapter.

Table 1
Organization and Location of Data Analyses for the Teacher/FOCUS Student Pairs

Teacher/FOCUS Student Pairs	Portrait Titles Chapter Five	Scenarios of Negotiation Chapter Six	Discourses Revealed from Scenarios of Negotiation Chapter Six
Ms. Hart Angela	The Scientist's Daughter (p. 109) The Biologist (p. 122)	1. Roles in the Classroom (p. 159) 3. Goals for Science (p. 173)	1. Trust (p. 164) 3. Learning (p. 178)
Ms. Smith Ann	The Veteran Teacher (p. 105) The Veteran FOCUS Student (p. 137)	2. Planning Science (p. 166)	2. Experience (p. 171)
Ms. Vail Ruth	The Applied Psychologist (p. 98) The Physician Assistant (p. 131)	4. Science and Testing (p. 184)	4. Testing (p. 184)
Ms. Roberts Kelly	The Creative Teacher (p. 115) The Teacher, Maybe (p. 143)	5. Communication (p. 185)	5. Miscommunication (p. 189)

FOCUS Context

Project FOCUS was initiated because a parent-volunteer expressed interest in having help with science at Evergreen Elementary school. According to Dr. Wilson, the parent volunteer was concerned that there was "this big university and all of the science and the science education that was going on there and there was very little connection to the community other than student teachers." Based on a concern for the lack of science and disconnect between university and community, Dr. Wilson and a science education doctoral student developed the FOCUS program. They based FOCUS on a model of an already established program. The program was established within Dr. Wilson's department; a graduate assistantship enabled a science education doctoral student to help with the program. According to Dr. Wilson, "what I did was tak[e] money that normally was provided to a student in our department and [transfer] it over to the college of education […] to support one of their graduate students." The graduate assistant orchestrated the daily operations and a reflection session for the FOCUS students. In the beginning there were approximately ten students per semester enrolled in FOCUS. At present, approximately 60 students participate in FOCUS each semester.

In terms of FOCUS' contribution to the community, Dr. Wilson felt that "teachers have gotten help teaching […] teachers have told us they wouldn't have been able to teach science at all if it hadn't been for the Project FOCUS students. So the kids are getting exposed to science in a way that is very positive." This echoed sentiments heard from teachers. For the most part, teachers praised FOCUS, and requested FOCUS students semester after semester.

FOCUS students bring science to elementary classrooms. From the graduate coordinator's classroom observations it was observed that when the FOCUS student walked into

the classroom the students lit up and made comments such as "the science lady or guy is here", or "what are we doing in science today?" These comments suggested that elementary students equated the FOCUS student with science time. Dr. Wilson's experience with FOCUS led him to believe that the program not only offered support in science instruction, but also provided elementary students with a different style of instruction. He suggested that in FOCUS, "one of the things that helps the children is that the lessons tend to be more active and if their learning style does not necessarily fit with the way elementary teaching actually happens sometimes there are more opportunities because of the way our students teach […] a way for the elementary students to engage a little bit more in school in general." The graduate coordinator observed the same thing while in elementary classrooms. Teachers praised the FOCUS students for coming in with activities that were hands-on and made comments about how they did not have the time to do such things with their children. Ms. Vail, a second grade FOCUS teacher made the following comment: "I just wish that we had more resources and time to do hands-on activities in science but we don't."

Most of the comments from FOCUS students indicated that their experience with FOCUS was positive. Dr. Wilson also had a similar experience. He commented that, "I think some of the things that have struck me the most almost every student who has taken Project FOCUS says it's one of the best courses they have had at the university and it is certainly the most different and they appreciate that difference and working in the community." Dr. Wilson also received feedback from FOCUS students about the positive impact the program has had on their own lives. He explained that, "the most rewarding is when students come back and say this experience has changed my life and it's usually because they had experienced things in a different culture that they had never experienced before, they have been really engaged in the

community." Dr. Wilson also believed that university students involved in FOCUS had the opportunity to work in the "real" community. He explained that "if they (university students) get into town it's downtown or it's you know some other shopping area and when you go to an elementary school you are truly in the community."

Even though the elementary classroom was a very new experience for these students, especially in schools of poverty, some students decided to pursue teaching after participating in FOCUS. This surprised Dr. Wilson; it was not one of his original goals for the program. He explained that, "one of the things that I did not anticipate at all is that there were a fair amount of students that ended up signing up and […] after Project FOCUS they go into teaching." Some students who participated in FOCUS have chosen to pursue a master's degree in education or participate in programs such as Teach for America. Sometimes students used FOCUS as a gauge to see if teaching was a viable option for them but later decided to continue their current degree path.

One of the things that bothered Dr. Wilson about science at the elementary level was the pressure of testing. From Dr. Wilson's perspective,

> The biggest thing [is] that there isn't any kind of a priority at all in elementary education and the CRCT and NCLB kind of process is pushing it out even further then it has before and in general it's in pretty sad state, it's such a low priority and I think the only way that is going to change if we ended up having end of grade testing for science, I would almost hate to see that happen.

The graduate coordinator of FOCUS saw physical evidence that science was not given the same amount of time as other subjects. When you walk into the FOCUS elementary schools you see schedules posted in every room, with science and social studies split fifty minutes a day. From

the graduate coordinator's experience of working with FOCUS students, at times, some have had to teach social studies instead of science. They were typically happy to teach social studies but it did sometimes raise questions for the university students about the priority of science in elementary education. Ruth, one of the FOCUS students participating in this study, said the following about the time for science: "Even on the scheduling of the day science and social studies share an hour of the day and math gets two hours, I mean it is important to build those skills for the next level, but science and social studies share an hour? Every school needs FOCUS."

Dr. Wilson felt that "the types of testing you have to do it keeps removing more and more time from teaching science in the elementary schools." It was his vision to negate the lack of time science was given it was necessary to expand the number of schools in the community that have FOCUS but "expansion that's not out of our control but to have our students teach as much science as possible." The graduate coordinator also envisioned that more schools in the community and beyond could offer such programs like FOCUS, but was at the same time, mindful of the challenges of maintaining healthy relationships with all stakeholders involved.

School Context

The principals at participating FOCUS schools were integral to understanding the school context in which FOCUS took place. The principals offered a perspective on how FOCUS was carried out at their respective schools and other important factors that affected how the school viewed FOCUS and its place in the larger school context. Thus, the world building task described in the method chapter was used to ask questions of the data and the underlining idea of situated meaning, in discussing how the principals situated FOCUS within the larger school context and the relevant Discourses that emerged.

Veteran School

Project FOCUS was initiated at Evergreen Elementary in 2002. Evergreen had a longstanding tradition of being a "science school" in the district. It was often referred to as the "science school" because it had a reputation of emphasizing science in the curriculum. Also, on the school site there were various gardens, animals, and other "science related" outdoor classroom tools. Evergreen enrolled over 600 students in grades pre-kindergarten through fifth grade. Almost three-fourths of the teachers had advanced degrees, teaching on average twenty-one years. The school had SMARTboards in every classroom and a new computer lab with mobile laptops. In terms of science, the school had a science trailer that parent volunteers worked to maintain that had a plethora of science materials to use in the classrooms. The school also allowed the FOCUS students access to the science trailer, making it available not just to the students working at this particular school but for all FOCUS students working across the district.

Mr. Pearce, the principal at Evergreen, did not necessarily want to place emphasis on testing but this was the reality he perceived for his school. From my own observations in this school there was evidence of the influence that testing had in the school. When you entered the school there were signs encouraging students to do well on the tests and "please be quiet, testing in progress." Mr. Pearce wished his school was not so test driven, but pointed to the lack of time they had to get everything done in one day in the following comment: "It bothers me that we are test driven as far as the curriculum goes, but you know everyone is scrambling how we can fit in everything that needs to be fit in a day." Mr. Pearce felt that Evergreen was fortunate to have resources such as the science trailer, ample supplies of textbooks, and other materials but felt there was a disconnect between the amount of resources and how they were organized. He expressed concern about resources not being organized in a way that teachers could access them

without spending much time gathering individual items. He mentioned the idea of having resources in a "backpack" aligned with the Standards so that teachers could save time and meet needed standards at the same time.

As explained in the theoretical framework and method chapters Discourses represented the larger picture of how stakeholders talked and acted through their existing commitments. In the above passages Mr. Pearce suggested that science was important at Evergreen but there was also a commitment to children doing well on standardized assessments. As will be discussed in the following section, Mr. Pearce not only verbalized this commitment to testing but it became apparent that it maintained a large presence in not only talk but practices in which the school and school faculty engaged. In the following sections the intent is to introduce readers to ways in which the Discourses of Trust, Testing, and Time became important in understanding how the principals' commitments were enacted. Recall that Discourses were not limited to only what principals' talked about in relation to their respective schools, but how their talk translated into action. For example, the principals talked about their commitment to standardized testing but it did not become an important Discourse until the researcher put this commitment into the context of how Testing actually affected the negotiations that happened in the classrooms and the larger context of FOCUS. In the following sections the Discourses of Testing, Time, and Trust will be explored in the context of the elementary schools and the principals. So what makes Testing, Time, and Trust so important and not other Discourses that represented the elementary schools? These three Discourses were not only important in the ways principals talked and acted within the elementary school setting but had relevance to how the community of practice of FOCUS was accepted at the schools. These Discourses were different from the other ways in which the principals talked about their respective schools because they were not limited only to talk but

were observed by the researcher as influencing the way in which the community of practice of FOCUS was formed and negotiated. Mr. Pearce used the Discourse of Time and Testing to construct the "world" of his school. He built his Discourse of Time as a challenge to get everything done in a school day and used his Discourse of Testing to discuss how the time they do have needs to be productive and focused on meeting the standards and thus succeeding on the tests.

Testing

Mr. Pearce had been the vice principal when the FOCUS program was instituted and thus had been a stakeholder in FOCUS for many years. He felt that Evergreen was viewed as being a "science school" because it had a long standing tradition of having an annual invention fair, gardens with native plants, animals, and of course the science trailer all on site. However, all these tangible items of "science" did not convince Mr. Pearce that Evergreen was actually a "science school." He felt it was almost an embarrassment to call it a science school because they were not doing well on the science portion of the CRCT. Here again his Discourse around testing was important because Mr. Pearce perceived that Evergreen's reputation as a science school was diminished because they were not scoring well on the science portion of the CRCT. Mr. Pearce's Discourse of testing was linked to FOCUS in that he had an interest in finding a way to improve science scores via FOCUS. Even though Mr. Pearce did not want the school to be test-driven, he felt that testing was important for the school's vitality and thus an important part of school context. Mr. Pearce felt that FOCUS could be viewed not only as a program to promote science learning but as a way to assist in achievement on standardized tests. He suggested,

> One thing that I would like to see if figure out how we can get it [FOCUS] to improve some of our CRCT scores that are really not that great and it's kind of embarrassing, we

have for years considered ourselves a science focused school and when you look at the numbers it's hard to support that.

The importance of scoring well on the CRCT and Evergreen's perceived challenges to do well on the science portion caused Mr. Pearce to think about how FOCUS could function to help the school achieve this goal. Although science was not included in Adequate Yearly Progress (AYP) the year this study was conducted, Mr. Pearce was projecting towards the future when science would count and considered FOCUS as a potential resource to improve science scores. Because the FOCUS students were already working in the school Dr. Wilson suggested that their science skills and knowledge could be put to use to help improve science scores on the CRCT.

In light of testing, Mr. Pearce viewed science as an important component in an elementary student's education, especially students learning and appreciating the applications of science. According to Mr. Pearce, science was important, but some of the things that worked against it were a function of testing and time. He explained this in the following way:

> I think it [science] is important. First of all as a way of thinking to help them think about being discriminating and them establishing cause and effect relationship and it is just, it trains a rigor of thought process. I think it's also important for them to know how their body runs and things that are good and bad for it and how their planet runs and what is good for the planet […]. Also, our water crisis right now, we need to know the science behind it to appreciate it and appreciate what the solutions are.

Although Mr. Pearce placed value on science education at the elementary level, learning to read assumed a higher priority. Mr. Pearce believed that if a child could not read then science learning would not occur. He explained that, "if we have a student that has problems with

reading we are probably going to take time from science or social studies to dedicate that to reading because without reading you don't have any hope for the science even."

Time

In light of testing, time seemed to be lacking for science. At Evergreen, if a child was not reading on grade level then time would be taken from science or social studies to provide additional reading instruction. The time was usually taken from science because the curriculum, dictated to the school by the county, did not dedicate as much time to science or social studies as other subjects. Here the Discourse of time became very important because other subjects were given priority over science. Thus, the commitment to other subject areas and the lack of time for science was a reality for Evergreen and constituted a large part of its Discourse. Mr. Pearce gave the following explanation for the restraints on science:

> [The lack of time for science] was determined on the time crunch, if we have only so many hours in the day and we are kind of mandated at ninety minutes a day for reading and language arts and a minimum amount of sixty minutes for math, then you figure in lunch and you figure in special areas, and there you would either spend twenty or thirty minutes on science or social studies every day or you would spending forty five minutes or hour on science for four weeks and then social studies for four weeks.

Trust

Time and testing limited the amount of time dedicated to science instruction. Where did FOCUS fit into these Discourses? Mr. Pearce recalled that the school's decision to participate was based on the inspiration "science experts" would bring to the classroom and elementary students. He viewed it as a way to inspire elementary children to potentially enter the field of science and pointed to elementary teachers typically not feeling competent in science. Here the

Discourse of trust began to emerge as Mr. Pearce placed trust in FOCUS. He explained part of the rationale for having FOCUS at Evergreen as,

> It's just we benefit greatly from having the expertise of people who are actually working in the field and they bring the excitement of the material as well as being role models, "and kids you know you can be a scientist too!" [… I read somewhere the] other day like three hundred thousand Chinese science major graduates will come out next year and thirty thousand will come out of the U.S. and of those more than half are foreign that are going back to their own countries, so we could be in some trouble here. And unfortunately, many people choose elementary education because they are much more competent in other areas and say well the science competency will come along.

Along with the principal's trust, teachers placed trust in FOCUS. Mr. Pearce valued the teachers' opinions and trusted them that the program was an asset to the school. He suggested that,

> Our teachers are very enthusiastic about the students and have been very supportive of the program and it has worked well from a participation standpoint. What they tell me is "give me another FOCUS student" that about says it to me as far as the worth, cause there are teachers that are picky about which graduate school their student teachers come from so I mean they are paying attention and if the FOCUS students were not doing worth while jobs in the classroom I don't think they would be asking for another, they would just be in the way, a waste of time.

Mr. Pearce used his teachers' views of FOCUS to inform his decision to continue participating in the program. Teachers did not directly tell him what they were learning or not learning but he took the teachers' word that the program was needed.

Mr. Pearce discussed where he would like FOCUS to move in the future. He trusted that the program helped elementary students have more opportunities in science, and he trusted that FOCUS students were getting experience in their community. However, he questioned what the teachers learned from the experience. He suggested he would like to see FOCUS move towards a co-teaching model so that his teachers were learning as well. From his observations of FOCUS he did not see the teachers actually in the role of teaching but on the sidelines. His vision for FOCUS was one which included all stakeholders having a role in teaching and learning. Mr. Pearce explained that,

> I think if we could, one possible consideration would be right now the model is kind of, either taking out a small group of kids or the FOCUS student in teaching and the regular teacher is just kind of sitting back appreciating or working on their grades for the week, and I think if we could get it into co-teaching model where the participating teacher can also get smarter and not just the kids I think that would require more work on the part of our teachers and we would have to think about how that would work but if in working more closely with the teachers the teachers could become better scientists and some the scientists would become better teachers.

Time, Test, and Trust were important to the Evergreen Elementary context, as portrayed through the lens of Mr. Pearce, the school principal. Time was very limited, especially for science. Testing and being successful on standardized tests was a priority and commitment for this school and thus ties back to the reasons behind the lack of time for science; remember science did not count for AYP. There was trust in the efficacy of Project FOCUS as teachers continued to ask for the program year after year.

The New School: Cedar Elementary

Cedar Elementary was the other school in this study, and the one that had most recently initiated FOCUS. It was in a rebuilding process due to concerns over how former administrators handled school funds. There were over 500 students at this school, and a high percentage of students were characterized as low-income, as close to 90 percent of students were on free or reduced lunch in the year this study was conducted (Governor's Office of Student Achievement, 2007). Approximately half the teachers had advanced degrees, and they averaged ten years of teaching experience. On the school website their commitment to language arts and mathematics was noted; students received two and one-half hours of language arts instruction everyday. One of the achievements noted by people at this school was that they had made AYP for the last five years.

Dr. Hahn was the principal at Cedar Elementary at the time FOCUS was initiated at the school, but has since left. She took the principal position at Cedar Elementary because of needed changes in response to the school's problems. She actually preferred to be at a middle school or high school but felt she was needed to help Cedar recover. In light of the school's condition she felt FOCUS was a positive addition to Cedar. Dr. Hahn said that,

> Middle and high school are my favorite, that is where my strengths are, but this school was just in such turmoil they needed someone. I was glad we were able to come on board [with FOCUS], because you know the state of [this elementary school] has not been the best in the past years, so I think it is good for them to have that partnership.

Dr. Hahn made the decision for her school to participate in FOCUS because she felt it was in the best interest of the elementary students to have opportunities in science. She felt elementary students engage in science when given the opportunity, and she felt that FOCUS could help accomplish this goal. She considered the opinions of many school employees and the

needs of the elementary children in choosing to participate. Interestingly, the assistant principal had been a teacher at another FOCUS school and had had a FOCUS student herself. She was also drawn to the program because it was centered on science education and felt her school would benefit from the help with science and engaging students in science. Dr. Hahn explained,

> […] after talking with my assistant principal, when she was a former teachers at [the founding school for FOCUS] she talked about how she really liked it, I went to some of my teachers and they thought it was a good idea, I presented it to them and we just decided to go from there. It was the science you know, it's hard sometimes to connect kids with science and this sounded like something that would really engage them in it, so we decided to give it a try.

As explained at the beginning of this section Discourses of Testing, Time and Trust, were revealed in light of the elementary school context. Here Discourses of Testing, Trust, and Resources will be discussed in the context of Cedar Elementary as represented through the voice of the principal, Dr. Hahn. Resources was not a Discourse that was necessarily revealed in the school context of Evergreen Elementary but was important to the context of Cedar Elementary as explained below. Resources were not only tangible things that this school needed but represented how they influenced the way stakeholders at Cedar negotiated FOCUS. Remember that Evergreen had resources, such as the science trailer, but as explained below, Cedar was lacking these tangible items and thus, influenced how Dr. Hahn and the teachers at this school taught science and talked about science in light of missing tangible resources. This is where the different school contexts became important and slight derivations in their Discourses revealed.

Testing

Dr. Hahn viewed FOCUS as positive for her school as a whole but was also committed to school success in terms of scoring well on the CRCT. Her Discourse of testing was very apparent. She was forthcoming in acknowledging the benefits of FOCUS for her school but made it clear that science was not a priority in light of other subjects that would be on the CRCT. She put reading first and felt science would not be possible if students were not able to read. In light of the emphasis on reading at Cedar, Dr. Hahn said that,

> [FOCUS] has made us take a little bit more look at science in a different way because you know with high stake testing being honest, most of the time you are focusing on reading, the language arts and your math, cause that's what you are testing […]. Science is important, I think they (the elementary students) need to learn to read first but science is definitely important because students need to know how things change, what causes change, and to me, that's how I see science […].

Trust

The principal viewed FOCUS as a success by listening to her teachers and their interest in keeping FOCUS students in their classrooms. She relied on her teachers' comments about the program to keep it in her school. She heard from teachers that they enjoyed the program and liked having FOCUS students so that was enough validation for Dr. Hahn to keep the program. This was very similar to how Mr. Pearce developed a Discourse of trust by listening to the teachers and their interest in continuing the program without seeking out further information of how the program was being implemented in individual classrooms or what children were learning. Both principals trusted their teachers to determine the success of the program at their respective schools. Dr. Hahn suggested that,

> The teachers have voiced it, I mean, you just wouldn't believe some of the comments, "I just love my FOCUS student" and it's definitely something that the school wants to continue to have a partnership because they really, really enjoy it.

Dr. Hahn's Discourse of trust was further developed in light of how she viewed the goals of FOCUS for her school. Her goals were constructed around students having an opportunity to learn more science but she also felt that all stakeholders were gaining from the experience. She explained that, "[the goals], what I understood them to be was that we would have the [university] students come in and help out students learn science in a different way. Not your typical textbook, […] actually have students actively engaged where they are learning science and really don't know they are learning science and plus making it fun […]." She felt her teachers were also learning through the experience but did not have any evidence to support this claim other than, "I think it's been beneficial for the teachers that have them to learn how to teach science in a different way, so both students and teachers benefit." She relied on her notion of what the goals of FOCUS were to construct her view of what was actually happening in the classroom. She relied on her teachers continued interest in FOCUS as a sign that they were learning as well as the elementary children. Dr. Hahn explained, "our teachers here love our FOCUS students and they are like, "when are we going to get more?" If we could have them for every teacher I think that they would really like it."

Resources

With all the positive aspects the principal saw in FOCUS she also perceived limitations for science based on funding and resources. Funding was a big issue for Cedar Elementary School and teachers that participated in the study consistently pointed to the lack of funding. Funding, especially for science, was part of how this principal's discourse was reproduced; she

had no alternative but to think about what science could look like in the future if funding was available. She wanted her teachers to have the resources and funding to be able to do the type of science activities she saw the FOCUS students do but felt that this lack of funding resulted in her teachers and the school relying on programs like FOCUS to offer these type of science experiences for the elementary students. She wanted her elementary students to engage in science by doing science but felt the restrictions placed on the budget inhibited this from happening without the aid of FOCUS. Dr. Hahn explained the funding situation as,

> Right now I don't think that enough funds are allocated to adequately teach science in a way that I would want it to be taught at the elementary school. So right now we are just kind of like putting things together, we have resources as far as what the state gives us, money to allocate for textbooks and that type of things but with that I just think if I had my way a lot more money should be placed in that area so that teachers would be allowed to create that interest in students to want to do science and that way they can have those activities like your FOCUS students are doing, because our teachers spend so much out of their own pocket already so if they could work on funding kids and all those type of things it would help teachers.

Summary of School Context and Discourses

These two different school contexts offered insight into how the stakeholders in the classroom, the teacher and FOCUS student, negotiated the FOCUS experience. The principals both spoke to the success of FOCUS in their schools but also pointed to their priority to make sure their individual schools did well in terms of making AYP. This was where the institution of the school system was reproduced and stabilized by the principals. Both principals stated science was not a high priority in their elementary schools in terms of time, and felt that was how

FOCUS could be justified within the school system and rules they operated under. The way these principals situated themselves in FOCUS and their reasons for keeping the program going at their school relied on the voice of the teacher. At both schools the teachers continually asked for FOCUS students and thus the principals viewed this as a pattern of success and intended to keep the program around. Testing, Time, Trust, and Resources all become very important later, when themes are discussed that emerged from all the different stakeholders interviewed in this study.

Chapter Five: Portraits

Introduction

In this chapter, communities of practice are used as a way to understand the places, people, and events that shaped how the teachers and FOCUS students viewed the world and how they acted in it. An important part of every community of practice is the commitments the individual brings to the community and how the commitments shape the view of their role in the community of practice and its affect on personal experience and actions. Portraits are presented of each classroom teacher and FOCUS student to depict the communities of practice they belonged to and the commitments that were important to them as they entered the FOCUS experience. Two types of communities of practice are particularly relevant here, that of the classroom teacher and of the undergraduate science student who participated in FOCUS. Because the classroom teachers and FOCUS students were the focal participants in this study it was important to understand their communities of practice to understand the negotiations that actually took place in the FOCUS experience.

Teacher Portraits

The Applied Psychologist

Background. Ms. Vail was a second grade teacher originally from a small, southern town. She moved to the northern part of the state because her husband was from the area. She was a second career teacher who started out in transportation after receiving her undergraduate degree in applied psychology. Ms. Vail explained that,

> [I majored in] applied psychology, so it was a lot of giving tests, evaluating, aptitude tests, um that kind of thing, marketing, psychology of marketing, that kind of thing. I traced railroad cars, full of shipments all over the country and talked to the people who ordered them and the people who shipped them and the people who were delivering them [and] I did that for three years, I think.

While she was working at Magnolia State she decided to pursue education. She was particularly interested in working with children with special needs. Ms. Vail described her motivation to work with children as, "I have an undergraduate degree in psychology and I decided I wanted to work with children with disabilities, really young children […]." Ms. Vail revealed that she grew up with a cousin who had an intellectual disability, and that experience prompted her to go into special education. For a long time she had been interested in learning about disabilities and decided that instead of just learning about it on her own she could pursue it as a career. She explained,

> […]when I look back, I have a cousin who has an intellectual disability and […] I gravitated towards the people who had disabilities and thing it just kind of I always read books about kids with disability and it all, and I just kept on doing this other stuff and I thought hey […] it doesn't have to be something I enjoy on the side or the weekend or whatever it can be something that I can do.

She started her teaching career in special education and taught in that area for six years. After spending time in special education she made the switch to general education. Her decision came not from bad experiences with the children but with the adults she had worked with in the field. She said that, "I felt like they didn't understand what these children needed." She knew the previous principal at the school where she was employed during this study. He offered her a job

and she had been at the school since that time. She explained that, "I went and interviewed and got the job and moved into regular ed." For the past five years she had been in general education at the same school. The year this study took place was her first year as a second grade teacher.

Experience with science. Ms. Vail had fond memories of select grades in elementary school through high school, but she indicated that she liked science more because of the particular teacher than the actual subject matter. She simply stated that, "I remember liking it more for the people who taught it than the subject matter." Her most memorable experiences with science were definitely those in which she did something hands-on. She valued the hands-on experience for herself, and in later discussions of her negotiation of the FOCUS experience, this theme was even more apparent.

Speaking about her experience in high school, Ms. Vail remembered some of the courses she took that had lab components but her memories of them were that they were very step-by-step instruction. She explained that, "it had to have been very step- by-step and do exactly this, you better get this result, you don't get this result you have done something wrong." In recalling those experiences it was apparent that Ms. Vail remembered her own experiences in science as being controlled by the teacher, not by herself as the student.

In college, Ms. Vail took a number of science courses because she started as an engineering major and then switched to applied psychology because of the number of math courses she had to take in engineering. She reminisced about how her college biology lab and her perceptions that it was not a good learning environment; this was a running theme for most of her science courses and more specifically, laboratory experiences. She did not remember much about what she learned in labs, although she remembered other incidents that happened in class. She recalled that,

> When I got to Biology I know we went and I tell you what I remember, there was a guy that was an Olympic runner who was going to the school at this time and he had the first mini television I had ever seen, it was about as big as your recorder and he would sit in the back and watch soap operas and the rest of us would go back and sit with him and watch the shows instead of doing the labs.

Stepping outside of the school setting, when asked if she had other experiences with science outside of formal education she very definitively answered no. "No (laugh), I don't think so. I hate to say this but no (laugh)." Thus, all of her experiences with science were in the classroom, and she did not view them as being positive learning experience.

Although Ms. Vail was not particularly interested in science, she indicated that she enjoyed reading. "I like to read, I will read anything and everything." Her commitment to reading was part of her community of practice as a teacher. She explained, "I have been trying to tell the students that when they get frustrated with their reading to tell them hey, I read things too that I don't understand and I have to read them again." She felt it was very important for her students to excel at reading and shared her own personal frustrations with reading things she didn't understand to help her students gain confidence in reading. This commitment to reading will reappear several times throughout this portrait and subsequent analysis sections.

Teacher education. As previously stated, Ms. Vail entered into education as a second career. She obtained both a master's degree and a specialist degree in early childhood education. She explained that the programs were very different from each other, and she felt that she received a much better education on how to teach during her specialist program. When she pursued her master's degree she was working at the athletic department at Magnolia State and the department heads gave her time off for course work. She explained that, "they came up with

this policy at the athletic department that you could be away from your desk for five hours a week for class and it didn't matter what you were doing, anything you wanted to take." Thus, she took advantage of this opportunity and started taking classes one at a time. Ms. Vail described her time frame to complete her masters degree as, "it did take me five years to get the masters because I was taking all those background classes one at a time." During her masters program she did not feel like she got the practical experience she needed for the classroom. She explained that,

> I would write all this stuff down regurgitating what I had heard them say but I also added a disclaimer of I don't know if this would be possible cause I haven't been in a classroom yet and I don't know if I could really do this. When is someone going to teach me how to write a lesson plan? When is someone going to teach me what to do everyday when I go in there? All the things that I never got taught and it seemed like they would be so basic and that someone along the way should have told me.

When she decided to get her specialist degree she chose another institution close by because she wanted practical experience that she could translate to her classroom practice. She described her decision of where to go as, "when I was trying to decide to do my Ed.D. that was part of it [this school] was much more practical." She preferred this institution because she had more opportunities to actually learn the practical applications associated with teaching, something she questioned about the institution where she did her masters degree. Ms. Vail explained that,

> It's much more oriented towards people who are working and who need the practical everyday what can I do in my own classroom experience and a lot of times I felt like at [the other school] it was more, um, more research and they were trying to turn us all into researchers.

In addition, Ms. Vail explained that neither program involved a science methods courses. To date, she had not had any professional development in science, even though it was supposed to happen. She explained,

> Well, we are supposed to be participating in [this science project with this organization] but I haven't seen or heard anything about any of them when they started several years ago we were supposed to have money to buy materials and go to trainings or do our own trainings, but I have never seen that.

Thus, her lack of experience with science in her teacher education program and professional development influenced her community of practice as a teacher; science had not been a priority in her education. Most of her professional development had been with writing and reading. Ms. Vail explained that,

> [My professional development has been] in writing, um, reading we just did social studies in February, we had a two-hour session on the new social studies [standards] but almost all of them were geared towards writing and reading.

What's important for the elementary students? When asked about what she thought students should learn in elementary school, Ms. Vail was quick to point to reading and writing as she said, "I think they definitely need to learn the basics of reading and writing to be able to communicate." She viewed reading and writing as the communication devices that could help students succeed. She wanted her students to have a desire to learn more and seek out information for themselves but felt testing, mandated testing, was inhibiting her students from being excited about learning. This is a theme repeated throughout the semester with Ms Vail and was a huge part of her community of practice as a teacher. She asked the question of, "why are we testing these children so much?" She also added that,

> I want to see them come out wanting to learn more and I feel, I guess that kind of goes back to the testing thing, they just go "oh not another and I have to do that" and I feel so much of the excitement is being taken away.

Because science education is at the center of Project FOCUS it was important to gain insight into the importance teachers placed on science in their own classrooms. Ms. Vail viewed science as important in terms of students learning about the world around them. Even though learning science was not one of her main goals for students, such as writing and reading, she did place value in it in terms of them learning about the natural processes of the world. She described what she valued in science for her students as,

> I do think it's important for them, I think it's important for them to understand it and be aware of it 'cause it might be something that they want to do later on, I think it's important for them to understand the natural processes of the world that are going around them like the leaves changing color, the weather, lately it's been water conservation you know, there has a lot been done on that and a lot talked about on that um, so I do want them to know you know, understand some of the basic things.

Summary of commitments. Ms. Vail made transitions in her time in education, from special education to teaching second grade. She probably had the most eclectic story of how she came to teaching of all the teacher participants in this study. Her interest in education was built around experiences she had with a family member. She valued science for her elementary students, in the context of them learning about the natural world, but her personal experiences with science in her formal education were not always positive. Thus, her relationship with science was really viewed through the lens of her elementary students and not herself personally. She was committed to children learning to read and believed there was a relationship between

student success and reading. Even in her teacher education program she had no exposure to science and that was maintained throughout her professional development. Ms. Vail placed value in the act of learning by doing and reflected on the lack of this style of learning in her masters program in education. Ms. Vail's views of learning through doing and her commitments to teaching will be important in later discussions of how stakeholders negotiated the FOCUS experience.

The Veteran Teacher

Background. Ms. Smith could be described as a "classic teacher" because she entered the profession due to her love for children and felt it would be a good profession for her as a parent and spouse. She said that, "I wanted to be a stay at home mom and teaching just kind of fit in to um, the schedule of being able to be with my children most of the time." Thus, her community of practice as a teacher was built upon her value of the profession as being good for her family and her desire to work with children. Ms. Smith explained that, "I've always been a nurturer as you always hear, I love children um, I just love to learn and share." At the time of this study, Ms. Smith had been teaching elementary school for almost thirty years and had been a partner teacher with FOCUS since its induction in 2002. She was a first grade teacher at the time of the study and had always taught in the primary grades; she felt she belonged there. She described her reason for teaching the primary grades as, "I know I'm better with the younger children, um. I never even thought about doing the older ones."

Much like Ms Vail, Ms. Smith indicated that she was an avid reader. She stated, "Oh, I am always reading, reading. Um, and yeah, you just learn so much […]." She placed value around the role of reading in learning. This added to her community of practice as a teacher in that reading for herself, and as later discussed for her elementary students, was vital for learning

to take place. Her commitment to reading for herself and her elementary students formed a large part of her community of practice as a teacher. Reading, in her view, was the key to success.

Experience with science. In terms of previous experiences with science, Ms. Smith had a hard time remembering elementary school. She said, "honestly I don't remember elementary." Although she had a hard time recalling her experience in elementary school she did remember a few things about science in high school and college. She explained her high school experience with science as, "[in] high school learning [we learned] from the book, lectures, um, we didn't have labs." She definitely made a connection between her experience with science in high school and not being prepared for lab based courses in college. Ms. Smith explained that, "I thought I was learning a lot but then I went [college] and I didn't do well on the lab and we were in lab um, so obviously it hadn't prepared me for that at all."

When she talked about her science education through college, although she had a hard time remembering specifics, she did remember and value the experiences she had that were hands-on. Ms. Smith recalled that,

> [the science in undergrad was hands-on]. It was 'cause I remember things, I mean that's what you remember the things you did. I remember fruit flies, and you do, you do remember the things you did.

Ms. Smith identified herself as having a love of learning, and she viewed herself as a person who was always asking questions and wanting to find answers. She explained, "I just love learning and am always curious and asking questions." This commitment to a love of learning and her recollection of science that was hands-on become important in later discussions of what she valued for her elementary children to know. She translated her own commitments to commitments and goals she had for her elementary children.

When she discussed her teacher education program and the science courses she took she definitely had a hard time recalling specifics, but did remember that she did not have any science in her graduate program. She explained that, "in grad school it was more language arts um, technology classes, math, um, curriculum design, things like that." The science experiences she did have came from experiences in high school, which were usually lecture based, and then a few courses in her undergraduate program which she had a hard time recalling. Her experience with science in her own education, although somewhat vague, contributed to her community of practice as a teacher because after her undergraduate career the formal science stopped. She did not have science as part of her graduate program, nor has science been part of her professional development. She explained her professional development as the following:

> I am not doing anything in science, I did one in math, two years ago, we have a lot of English language arts, math, um, this year No, I haven't had any [science professional development] I think they are offering one, but I haven't signed up for it.

Ms. Smith was not alone in not having professional development in science because all teachers in this study had similar experiences. They typically participated in professional development in the areas of reading and math, which again, were the focus of meeting AYP for the respective schools. For Ms. Smith and the other teachers in this study the lack of professional development in science was part of their community of practice as a teacher because other subjects were higher priorities over science for the teachers themselves and their learning.

What's important for elementary students? To understand Ms. Smith's community of practice as a teacher it was important to know what she felt was important for her students to learn in her classroom. She placed value in them learning to read and had this to say. "I focus on reading, loving reading. We read and we read and we read because if they can read they can do

anything else." She felt students could learn much from reading and that was her focus and commitment in first grade. She also saw a link between reading and science. She explained that, "we can learn so much about science from reading, they just get so much from reading so that's my focus in first grade." Ms. Smith was very candid about her commitment of getting her students to read and love to read. She viewed reading as the link to everything else that the children learn and felt it could be used to learn about other subjects, such as science. Even though she was committed to reading she did value science for her elementary students. She felt that her students gained valuable science knowledge through reading science text. In the negotiation pieces it will become further apparent how Ms. Smith viewed the role of science teaching and learning in her classroom and her reliance on FOCUS for science instruction.

Summary of commitments. Overall it was more difficult to get information from Ms. Smith than some other teacher participants. Her community of practice was founded in her role as the veteran teacher who had spent her entire career in elementary education. There were two teacher participants in this study, one first year teacher and one veteran teacher of thirty years, both chose a career in education and didn't mention alternatives—they stated that teaching was their calling. Reading was the largest part of Ms. Smith's community of practice as a teacher because it was not only something that she valued for her students but herself as well. Another part of Ms. Smith's community of practice was her own experience with science. Although she did not remember much about science she did value the experiences she had that were hands-on and not lecture based. Because her undergraduate career she has had very little experience with science as a learner herself. This lack of science in her own education definitely added to her community of practice as a teacher; her commitments seemed to be heavily weighted in reading for herself and her elementary children. In later discussions about how this veteran teacher

viewed science in her classroom, it will become apparent that she placed emphasis on the lack of time she had for preparing meaningful science lessons, and thus looked to FOCUS for support.

The Scientist's Daughter

Background. Ms. Hart always wanted to be a teacher, she explained that, "ever since I was about eight I played school, the girly thing, but it stuck […]." She also had the unique opportunity to participate in a student teaching program in middle school and high school that allowed her to be in a local elementary school for about two hours a day. Although Ms. Hart was a first year teacher she had spent a significant amount of time in elementary classrooms. Ms. Hart has lived in the community surrounding Magnolia State her entire life, including college, and had no plans to leave in the near future. She always wanted to be a teacher and really never diverged from this goal throughout her education. She equated obtaining her first teaching position to winning the Nobel Peace Prize. Ms. Hart explained that,

> when I got offered the 5th grade position my parents took me out to dinner, like I had won the Nobel Peace Prize, there was no more goals to reach I had done it so it was like you did it, I did it finally!

Even though this was Ms. Hart's first year as a full time teacher, the previous year she had served as a paraprofessional in a first grade class. Before becoming a paraprofessional in the first grade classroom she had completed her undergraduate in Early Childhood Education at the large university in the same community; although she talked about returning to get her masters she wanted to gain experience in the classroom first. She decided to teach fifth grade because there was an opening at the school where she worked. By working as a paraprofessional she realized that she wanted to teach a higher grade. She wanted the opportunity to teach more and "wipe noses" less. She explained, "they offered 5th grade and was like well, haven't done it but I

love it, I love it!" There was more than just not having to wipe noses that Ms. Hart enjoyed about the 5th grade. She enjoyed the feeling that she got when she had the opportunity to relearn things with the students. She noted, "I am learning as well as the kids, and having to teach it as well, it's nice." Ms. Hart's community of practice as a teacher was in part shaped by her recognizing learning taking place for not only her students but for herself as well. The importance of the experience of learning becomes even more apparent as Ms. Hart's education and the educational goals she has for her 5th grade students are discussed. She definitely came to college with much more teaching experience then most and remembered many students dropping out of her cohort because they realized teaching wasn't their path. Her goal was to become a teacher from a very early age and she felt she had "done it" when she got her first teaching job.

Experience with science. Even though Ms. Hart noted on several occasions that science was not her strong point, it was evident that her mother was a huge influence in terms of the science that she received outside of school. She described the influence of her mother as, "my mom […] is a scientist so my entire life has been consumed with science, I mean Christmas presents were microscopes. Barbies didn't exist in our house." Ms. Hart's mother definitely surrounded her with science outside of school and she had memories of going to her mother's lab to play with science equipment. She commented, "we would get to go into her lab and play with, of course, appropriate pieces of equipment, and stir things and mix things and we were, she is probably sad I am not a scientist." Her mother would always encourage her to look up things in science books that were around the house and Ms. Hart explained how a visit to the Botanical Gardens was a regular Saturday event. Ms. Hart had many science opportunities afforded to her by her mother outside of school but did not view her science experience throughout her formal education as very valuable. She didn't have any distinct memories of science in elementary

school or middle school but had comments about science and her general education in high school. She was very involved in high school and commented on her regrets for not pushing herself more. She said,

> I was, like I was the nerd that wasn't in the AP classes, […] but I was the one with hundreds in the above average classes and I always did all my work and on time and I wouldn't say that I tried very hard because it wasn't pushing me, I was like okay, and I would turn it in and looking back now I kick myself for it but what are you going to do. I did a whole bunch of clubs and sports.

In terms of her experience with science in high school she recalled the only labs she ever did in high school were in chemistry and they were infrequent. Ms. Hart explained, "we would maybe do a lab, once or twice a week, no only once a week, on Friday, we had a lab and that's the only time I ever saw, […] a lab report." When asked specifically about biology, she indicated there were no labs involved in her biology education. Throughout the interviews she expressed enthusiasm about teaching life science despite the lack of positive experiences she had with it in her formal education. Ms. Hart explained, "no, biology the teachers just talked and talked, and talked, there weren't any labs." She also commented on how only the students taking AP courses got teachers that were dedicated to science. She remembered that because she was not in AP courses she did not receive the same science instruction and thus internalized it as not important. Ms. Hart summarized her science experience in high school as,

> I remember high school a lot cause for some reason our school decided that all the football coaches should teach science and social studies so it was kind of, unless you got AP you had like scientists basically teaching you, oh okay, we are doing this okay, what

are we doing again, I'm just going to talk to you and not worry about my science, it wasn't structured as much […].

In college Ms. Hart also felt that she didn't receive much science instruction with only two science courses required, one, which was her science methods course. She commented, "I feel like we didn't actually get into as much as we needed, […] every time I went it was like what we did the last time, it wasn't enough, […] and I didn't think I got a lot out of it." Ms. Hart, throughout most of her formal education, did not feel that she received either quality science instruction or was pushed to excel. Her experiences with science in the past informed her community of practice as a teacher because they ultimately shaped her perception of what she viewed as important for her students to learn and gain from science instruction. Although she didn't feel she got much out of her science courses in her teacher preparation program, the practicum was very important and useful to her. She explained that, "[…] really I learned more out of the student teaching blocks than I ever did in class." This was how her previous experience in the classroom may have given her an advantage. She had already spent time in the classroom whereas others in the cohort were experiencing teaching for the first time. Ms Hart witnessed several people in the cohort decide that teaching was not for them during the practicum but she felt confident that this was the path for her. Her commitment to teaching from an early age was a large part of her community of practice as a teacher; she never questioned her decision and felt that she has reached her goal; an elementary teacher.

In terms of professional development Ms. Hart had yet to have an opportunity to participate in experiences related to science. She had ideas of why they were not offered more readily to teachers. She explained that, "they don't really offer much in science, I guess because in the school system it's not considered a pass or fail grade do you know what I mean, so it kind

of gets pushed to the back burner." Because science was not considered with respect to a school making AYP, Ms. Hart felt it was not a priority, especially in regards to professional development opportunities. She was not alone in not having professional development in science; all the teachers in this study shared similar stories of doing professional development in reading and math but not science. This added to Ms. Hart's community of practice as a teacher in that there was not a commitment to science professional development at Evergreen Elementary.

Although Ms. Hart had not had professional development opportunities in science, did not have very many positive experiences with science in school, and did not consider herself a science person, science was one of the first things she thought about in planning for lessons because her students got excited about science. She explained that, "when I sit down to do my lesson plans it's (science) the first thing to pop into my head." Even though science was not something she considered a part of her own identity and interests she did consider it as a teacher. She made the comment that "[science is…] always something that the kids always ask about too." Thus, her community of practice as a teacher was definitely influenced by what her students asked about and were excited to learn.

What about the elementary students? Ms. Hart did not only think about the logistics of planning science lessons for her students. She viewed science as a way for her students to make important connections to their lives that did not necessarily happen with other subjects. She explained her reasoning as, "[science is] everywhere, everywhere and it kind of answers all their (her students) questions." Although Ms. Hart's experience with science in her own education was not transformative, she did place value in it for her students because it was a subject that they get excited about and saw a connection to their own lives. She suggested that,

> [science is] the one class that I can say at least every child in this classroom is engaged and constantly asking questions and then if one doesn't know, then they will say what about this, and it's the thing I feel answers a lot of life questions too.

For Ms. Hart, science was where she saw her children most engaged. Thus, Ms. Hart's community of practice as a teacher was formed by her students' interest in science, and as later discussed she contributed much of the success of science with her students to Project FOCUS.

Stepping away from science, Ms. Hart had a large interest in her students developing social and organizational skills. She explained, "we're working on is the social abilities that is my big one […] and secondly is to organize." Because her students would be moving to a middle school environment the following year she placed emphasis on them learning to take responsibility for themselves. She was committed to helping her 5th grade students develop study skills so that they would be successful in a middle school setting.

The final part of Ms. Hart's community of practice was her commitment to a vision of teaching. Ms. Hart would have liked her classroom to be a place of "discovery, that is guided but open exploration." As will be discussed in length in later sections there was a constraint she felt inhibited her from teaching in this style, the testing mandates. She placed value on students excelling on standardized exams but had a strong opinion about the amount of testing. She noted that, "too many, too many, even the kids, they hear the word test, and they are like ahhhh, you don't even finish the word test and they hate it, cause we just do it too much." This theme reappears over and over through the analyses chapters but Ms. Hart definitely embodied this discontent because she had a vision for her future classroom.

Summary of commitments. Ms. Hart's portrait revealed her community of practice as a teacher who viewed science as important for her students and thought about science when

planning, but in her own schooling did not have great experiences with science. The influence of her scientist mother gave her opportunities to explore science outside of a formal education setting, but as previously described, she viewed her formal education as lacking positive experiences with science. Her goal was to become an elementary teacher, and she had achieved this goal. Ms. Hart's portrait revealed that she was a beginning teacher who included science as a very important part of her community of practice as a teacher. While Ms. Hart did not have a good experience with science in formal education, she still valued it as a teacher in part due to the influence of her mother. She saw her students excited about science, in part because of the FOCUS experience, but also because of their innate curiosity and ability to think about their own lives in conjunction with what they were learning in the classroom, something she didn't see with every subject she taught.

The Creative Teacher

Background. Ms. Robert came to teaching as a second career. She was originally from Mississippi but relocated because her husband received a minister position at a church in the area where they currently live. Her undergraduate degree was in Church Activities and she was very involved in the church where her husband served as minister. She decided to go into teaching because of her interest in working with children. She explained, "I was a teaching assistant and also taught pre-K in our church setting and just loved it." Her decision was also based on the fact that she believed it would be very hard to get a job at the same church as her spouse and she wanted to be able to worship at the same church as her family. She made the decision to get her masters in education while working as a paraprofessional at the same school she taught in at the time of this study; she had been teaching kindergarten for five years. She was selected to be called the "creative teacher" because she talked at lengths about her interest in art and being an

artist. She was inspired to pursue her certification after working as a paraprofessional with a particular classroom teacher who she considered very creative. She explained, "I don't remember having really creative teachers and so it really just sparked an interest and I thought I am going back and get my certification and my masters." Ms. Roberts defined herself as a creative person and so seeing a creative person function in an elementary school successfully, obviously had an effect on her decision to teach elementary school. She explained her decision as, "I am a really creative person and I thought school is really fun. A lot of people say, 'why weren't you an art teacher'?" Ms. Roberts was a creative person and you saw that when you walked into her room, it was colorful and inviting, especially for young children. The daily classroom routine engaged students in learning through movement; dancing, and singing. With her sense of creativity she felt she was well suited for the kindergarten classroom. Her comment was, "I love kindergarten and it let's me use my creativity and be with the little one's too." Her creative nature definitely informed her community of practice as a teacher. She spoke to religion as being a big part of her life and felt it was her "calling" to work with children. Ms. Roberts commented, "I can see God's hand in leading me to this point I feel called to work with children."

Experience with science. When Ms. Robert was asked about her science experiences growing up she had a hard time recalling science from elementary through high school but also noted that it wasn't her main interest. She felt like she had a difficult time remembering elementary school because the "push was read and write, read, write and math." She had a few recollections of science in high school but only memories that included her being able to be creative. She revealed her memories as, "I remember in high school having to keep a journal and had to draw diagrams and that I liked cause I am an artist." Even reflecting on college she had a hard time recalling the science courses she took, as it wasn't her interest. She actually did not see

science as applicable to her daily life. She simply said, "No, not really (laugh), it's just something that's there that's part of our world that god created."

Although she had a hard time recalling her experience with science in her earlier years of education she did remember positive experiences in her science methods course in her masters program. She felt the instructor of the course placed emphasis on the students creating lessons and teaching them to each other; something she valued as an educator. She also saw the experience as positive because she had the opportunity to do hands-on activities and the instructor was very enthusiastic about the field of science. Ms. Roberts felt it was "exciting for us not just sitting there, not being bored." Her teacher education program as a whole was a positive experience and she felt that she learned a great deal because it was a non-traditional program in which there were many practicing teachers going to school part-time to complete their master's degrees. Ms. Roberts explained, "I was with teachers that were already certified but were working on their masters too, so it was a good cross section of people." She felt she learned a great deal from the cohort. Ms. Roberts attended the same institution where Ms. Vail completed her specialist degree, and as described in her portrait, she also had a positive experience.

Ms. Roberts, like many of the teachers in this study, felt her student teaching experience and that as a paraprofessional provided her classroom experience. She explained, "[I got experience in the classroom] more in student teaching." She did value the time she spent in her own course work because some of her courses expected her to come up with notebooks of lessons and activities. She described this experience as, "we had to come up with a notebook or a file of games and activities which I liked so I really appreciated coming into a classroom I felt more equipped." As stated above, she had a hard time recalling science in her formal school experience besides the science methods course she took while pursuing her master degree in

education. She had not participated in any professional development in science, which was a running theme for all the teacher participants in this study. With respect to professional development Ms. Roberts explained, "none of them have been in science […] usually they are guided reading and writing workshops."

What's important for the elementary students? Because Ms. Roberts was a kindergarten teacher she placed emphasis on creating a safe environment for children to learn. She explained that, "I think first of all they need to feel safe at school." As discussed earlier, her room was very inviting and that translated into her idea of creating a safe space for her students. In creating this safe space Ms. Roberts wanted her students to feel that they could try things without feeling they had failed, if they didn't get it right the first time. Ms. Roberts summarized her view of creating this safe space as,

> They need to feel that I could try things and if I mess up it's not the end of the world and you know we celebrate with each other if they mess up in here let's try it again, let's try it this way or how else could you do it so we try, you know I try to get them to not be afraid to speak out, to participate.

As a kindergarten teacher Ms. Roberts goals for her students were much more founded in learning to be a part of a social environment and learning life lessons. When asked about her academic goals for her children she referred to the curriculum guide the county gave her on what to teach. She didn't really have very explicit academic goals for her students besides acknowledging that she taught all the subjects and that the development of social skills was very important. The emphasis Ms. Roberts placed on her students developing social skills over distinct academic goals informed her community of practice as a teacher. She was committed to

helping create a safe environment for children to learn in but did not have defined academic goals that she felt were important beyond what the county curriculum dictated.

In terms of her goals for science, she did value experiences that allowed her children to do hands-on activities as a way to explore their world. She used the example of the five senses and the importance of her students using the senses to learn about their world. She said, "[…] in here the five senses are one of my favorite units and a good way for the little ones to learn about our world." She felt the type of science experiences afforded to her students were limited because of a lack of resources. She explained that when she did a unit on rocks and soil with her students she needed materials and resources but the school could not provide them. Thus, Ms. Roberts would ask for, "maybe some more fieldtrips or if we knew of more resources or someone that could come in and talk about rocks and stuff."

Summary of commitments. Ms. Roberts did not have many memories of science in her own life. Nevertheless, as will be explained later, she viewed science as important for her students, even though science was not a major component of her life story. Science was something that she viewed as part of how she saw the natural world in light of her religious views. Her community of practice as a teacher was based on her ability to make her classroom a safe learning environment for her students. This commitment seemed to be the most important part of her role as a teacher.

Elementary Teachers' Commitments as Indicative of Community of Practice

The portraits presented above outline commitments associated with teachers' experiences in teaching, their own education, specifically in science, and other life experiences. The goal was to not only discuss the individual commitments of stakeholders but what they meant together in terms of the larger FOCUS context and experience. Thus, when the teacher portraits were

examined together, commitments they shared in relation to the community of practice of teachers was revealed. These commitments indicated that their elementary students, pressures of testing, and prior experiences with science characterized this community of practice.

The classroom teachers' community of practice was characterized by commitments to their students. They all wanted their students to have a safe learning environment. Ms. Smith, Ms. Vail, and Ms. Roberts focused on the importance of reading for academic success. They all viewed reading as a means to learn other subjects. Ms. Hart taught fifth grade and was not necessarily committed to the goal of having her children learn to read, but was committed to helping them excel and learn on their own. In terms of science, all the teachers felt science was important to varying degrees, however, they did not always have positive experiences with science in their own education. As revealed in the portraits, the teachers, at times, had a hard time recalling what they actually learned in their science courses. They all commented on either having very little or no science in their teacher preparation programs. It was interesting how they viewed science as a commitment in their respective classrooms but in their own education their experiences were not entirely positive. The teachers also did not report having opportunities to do professional development in science. It seemed this was possibly a combination of their own commitment to other subjects and experiences with science in their own education. It is important to put these commitments in context of how a community of practice of teachers develops. A community of practice does not develop from just a simple interest but takes repeated exposure and participation in the community (Wenger , 1998). If the teachers were never able to participate in a constructive community of practice of science education then it could be argued that it would naturally not be a commitment or value they held for themselves or their students. However, these teachers did value science for their elementary students. What in

their commitments drove them to consider science an important part of their students' education? It was important to consider more than just what the teachers verbalized about their commitments but the resultant Discourses. Discourses were used to represent what could not necessarily be accounted for just in how stakeholders described their commitments and communities of practice.

To understand the Discourse of science teaching that developed, the commitments teachers had, in terms of testing, needed to be explored. All the teachers voiced their commitment to student achievement on mandated tests. It was not that they necessarily believed in this form of accountability but they were forced to consider it as teachers. Thus, this informed their Discourse of science teaching in that they valued science as a subject but because of testing constraints, they felt they could not provide the type of science experiences that their students needed. Thus, they relied on FOCUS and the university students to help fill this commitment to science teaching. The Discourse of science teaching helped the researcher further consider why teachers actually chose to participate in FOCUS and this will be explored in an upcoming section of the analyses chapters.

Student Portraits

The Biologist

Background. Angela was a sophomore animal and dairy science major at Magnolia State. This was her second semester with Project FOCUS. She had ambitions of pursuing a Doctor of Veterinary Medicine degree, focusing on equine reproduction. She grew up in a small town in South Georgia which she described as, "pretty much everyone was from a farm family or an agricultural family. We have more than one traffic light but it's still pretty small by most people's standards." She described her town and the lack of diversity she experienced in her private school as, "in our private school my sister and I made up the diversity clause pretty much being Native American or part Native American.**"** She started out in public school but in middle school moved to the private school in her town. Her involvement with 4-H, which still continued for her in college, gave her opportunities to get out and "see the world." Her involvement in 4-H will be discussed in much greater detail later in this portrait. Her experience with 4-H definitely shaped her community of practice as a science student because it helped her develop her interest in animals, specifically horses, and a field she wanted to pursue as a career. She commented on the difficult transition from such a small school to a large university setting. She struggled with learning to study when she got to Magnolia State, a skill she had not developed while attending the private school back home which she described as,

> It was still a shock going from five people to 300 here, it was like oh goodness and of course studying, you didn't have those study skills with a school that small, we didn't use the book, they stayed in our locker all year.

Angela did not use textbooks as a learning tool in her formal education before college. When she got to college she was shocked because she was required to learn from textbook readings. For Angela, the use of textbooks was a new experience and she had to adapt to this style of learning.

She was called the biologist by the researcher because she had always surrounded herself with science. Angela grew up in a farming family and was always surrounded by land and animals. Even though she didn't live on an actual farm her entire life, her family always had land and she was continually exploring nature along with her father. She described one such example as,

> I found this snake [… and] we would keep it inside and feed it some mice for a month […]. We raised a baby bobcat when I was very small and I remember we had tanks full of bunnies, so we had all these bunnies and all sorts of animals, always around.

Her introduction to science was not through a formal classroom environment but rather by exploring her surroundings. These experiences early in life informed her community of practice as a science student because they shaped her initial interest in science and pursuing veterinarian medicine as a college major and future career. Of all the participants, Angela's community of practice was most shaped by the science experiences she had outside of the classroom. She explained that, "I have been really lucky and have had more science outside of the classroom then I ever did in."

Angela was definitely curious about science growing up and took it upon herself to learn about science. She noted, "I pretty much kept my nose in books, science books, that's all I wanted when I was eight years old, all I want is a microscope, […] just constantly science." She immersed herself in books, especially anatomy books. Angela explained that, "I had anatomy books that I would read cover to cover, I loved them I would carry them around with me all the

time." She would seek out information about life science on her own not relying on gaining this knowledge from school. Her curiosity and love for science definitely informed her community of practice as a science student and will become more apparent as her negotiations of the FOCUS experience are discussed.

Angela's father was also a very big influence on her exploration of science at an early age. Her father would take her hunting with him and brought back fish from fishing trips. Instead of Angela just enjoying the fish for food she had other ideas of how to use them to learn more about anatomy. She described her experience with dissecting a fish in the following passage:

> I was probably about four or five and I took one of the fish that had died and went and got one of my dad's pocket knives and I am sitting there dissecting this fish like one little piece at a time and looking at it and so interested in how everything worked and fit together.

All these early memories of her interest in science and exploration outside the classroom defined the type of science student Angela was in college and wanted to be in the future. Her community of practice as a science student was not only about achieving her goal of getting into veterinary school, but reflected an underlying passion for learning science. From an early age Angela took the initiative to learn about science on her own and, as will be discussed, the science she learned in the classroom did not meet her expectations.

Experience with science in school. Angela's experiences with science outside of the classroom were very important for her in terms of developing her community of practice as a science student. She recalled the first science she had in a classroom setting, taking place in fifth grade. She didn't have memories of what she actually learned, perhaps because she surrounded herself with science so much on her own. Angela did, however, remember participating in a

Saturday program at a nearby college where she was able to take courses in paleontology and chemistry. She actually used some of the hands-on lessons she did in the program for her own lessons in FOCUS. The opportunity to do hands-on science was memorable for her and she translated that into her own teaching practice in FOCUS. In middle school she only remembered learning from the book. She described this as, "I can remember going through the book, learning, but not many labs." She was frustrated with her experience with science in elementary and middle school because she felt the teachers would not answer the many questions she had about science. Angela explained, "especially in the elementary school and middle school I feel like the teacher said here's the information, […] here you go and don't ask me any questions." Her experience with science in high school was both a mix of good and bad. The negotiation processes are discussed in a later section it will become apparent that Angela did not want to replicate her own experience in science as an elementary student for the students she taught in FOCUS. Her positive experiences in high school with science were correlated with the people that were teaching the subject; she felt that her positive experience stemmed from the teachers being actual scientists and knowledgeable in the subject area. She described her high school science instructors in the following way:

> In high school […] my first biology teacher, my biology 1 teacher, […] I don't know what her job title would be but she did all the blood work of the lab at the hospital, so she was definitely a scientist and then my second one was a poultry science major and had done a lot of research so that was great. And I guess in 9th grade we had physical science and we actually had a nurse as the teacher that year.

Angela had great experiences with life science in high school, great teachers and labs. She enjoyed her biology courses because she felt she was constantly doing something hands-on. She

explained that, “in biology we had great lab, every week we were doing something, dissecting something, or looking at something under the microscope constantly experiments, hands-on and that was a lot of fun.” Chemistry in high school was a different story for Angela. She felt that she came to college not prepared to take chemistry because she had never been exposed to it in high school. Her comment was, “I was behind and I had really never seen that stuff.” She was disappointed because she felt she did not learn very much in chemistry in high school because it was based solely on the textbook and without a lab component.

Being a science major. Angela was not the typical science major because, in addition to her academics, she was involved in many other organizations inside and outside of the university. She continued to have a leadership role in 4-H throughout college, something she had been involved in from a very young age. 4-H played a very important role in her life growing up and thus informed her community of practice as a science student. Without this experience it could be asked if she would have ever been interested in pursuing a career in science. She had such pride in her affiliation with 4-H that she took time during FOCUS to tell her fifth grade students about 4-H and the opportunities the program offered. The role of 4-H in her life informed her community of practice. It was not only something that helped her grow in terms of being a science student but she believed it was something important for youth to know about today. She described her involvement in 4-H as,

> [it’s a] really enormous part I would say. It started out in fifth grade […] and then it just really grew every year from that point […]. [4-H has sent me] all sorts of places as well as that I’ve gotten a lot of scholarships through my 4-H involvement. For college so on top of the [state] scholarship that I already have I’ve got a lot of, um, I got a lot of scholarships through 4-H directly and then my projects through 4-H, I have a Toyota

scholarship and a couple of others. I am in the collegiate 4-H program and we really try to give back to our youth that are coming up and show them how important 4-H [was for us].

On top of Angela's continued commitments to 4-H in college, she was also involved in many, many other activities; she was a very involved college student. Most of these activities were directly linked to her career goals of being an equine veterinarian. She positioned herself in roles that would hopefully lead to acceptance to veterinary school and her goals of working with equine. This definitely shaped her community of practice as a science student because she not only had commitments in the classroom but also valued the experiences she had in other organizations, especially those related to equine medicine.

Angela was the only animal science major among the student participants in the study. According to Angela, animal science majors have many opportunities to do hands-on science, more so than biological science majors, typically pre-med. She explained the lab opportunities she had in her major as, "we have fabulous labs [in animal and dairy science], I really love all labs, anything that is talked about in class is pretty much reinforced in lab." In her course work Angela got to handle animals, learn about animal reproduction very intimately, and worked with equines on a regular basis. She shared the following example. "If we were talking about the structure of the ovary they could point it out to us, this is what it actually looks like, you can touch it [and] know what color it is, in real life." Thus, Angela's community of practice, as a science student, was shaped by experiencing science through hands-on activities; accordingly, she believed this was the best way to learn science. She explained that in her program, "they really emphasize hands-on." Later it will be discussed how her community of practice and thus

commitments to hands-on science played out while she was working with her fifth grade students in FOCUS.

Angela was very happy that she chose to major in animal and dairy science but felt the major sometimes carried a stigma with other students who were pre-med and biology or biological science majors. She described her frustrations as, "I get really irritated with the pre med majors who are like 'oh you are a vet major'." She valued her major and wanted others to know the challenges and benefits of being an animal and dairy science major. She felt that some other science majors didn't know the rigors of being an animal and dairy science major and thought students with this major was viewed as sometimes not being as smart. She really didn't understand why but suggested that,

> Maybe since we are dirty all the time (laugh) you know we might not look good all the time. I guess because we are dealing with animals and oh, "you are dumb" and I am like "oh, not really." It's a big joke in animal science and I guess everybody understands that if someone asks what will I do if I don't get into vet school well, everyone says "well you just go to med school because it's a lot easier" and that actually happens a lot.

Thus, her community of practice went beyond just being a science student to include, more specifically, an animal dairy science major and the challenges that brought to defy the stigmas surrounding the major that some people carried.

Angela's decision to be a science major was very much influenced by her career goal to become a veterinarian. She had always wanted to be a vet, although as a teenager she waivered between studying to become a physician or vet. Her decision was solidified after working in a horse stable her senior year of high school, where she was in charge of the care and maintenance

of several horses. This experience not only solidified her decision on wanting to be a vet but also to specialize in equine reproduction. She explained her interests in this field as,

> I really liked just the care of the horses, so anything medical going on, I was right there getting to watch the vets come out and when I got towards the end of high school I decided definitely vet and then it shaped into equine vet and now it's shaped into equine reproduction.

Angela had, from an early age, assumed that she would be attending Magnolia State. In her senior year of high school she got an offer from another university offering her automatic acceptance into their veterinary school. She had to weigh her options and ultimately decided to come to Magnolia State because she felt it was a better fit for her. (In later interviews she discussed the difficulties of getting into vet school and questioning her decision to go to this university and not the other). Angela's continued vision for herself with respect to becoming a veterinarian definitely informed her community of practice of science student because she not only viewed veterinary medicine as a career but as a life long dream which she had been preparing for, for a long time.

Experience teaching. Until now this portrait of Angela has focused on her experiences with science inside and outside of the classroom. Because this study focused on a program where teaching took place it was important to know what educational experiences the FOCUS students had before starting the program. Angela had teaching experience with her church back home and leadership roles in 4-H. However, before FOCUS Angela had never worked in an elementary classroom. FOCUS was a new experience for her. She explained that before FOCUS, "[I have] not really [taught before] in the traditional classroom setting."

Even though Angela definitely wanted to share science with elementary students she did not enter Project FOCUS viewing teaching as a potential career path. Her community of practice as a science student was directly related to the career she wanted to pursue and teaching was not part of that community. Angela explained, "teachers are very talented people and that's just not exactly one of my talents or nor do I have a real passion for it." According to Angela, she had enjoyed her FOCUS experience thus far because she got to share her passion for the science with students, but believed she would not want to teach the other subjects or be a "good" elementary teacher. She put it simply as, "I love going because I get to do experiments!"

Summary of commitments. Because this was Angela's second semester in Project FOCUS her experience was definitely influenced by the time she spent in the classroom the previous semester. One of her biggest challenges in teaching in FOCUS was making sure that she was conveying information in a manner that the students could understand and retain. Classroom observations revealed that she had made great strides in doing this; of course her partner teacher had assisted her in this along the way (this will be discussed in the negotiation section). One might state that Angela embodied the community of practice of a science student. She not only had an interest and commitment to science as a subject matter, but continually involved herself in science even outside the classroom. Her community of practice as a science student was built around her personal love of science, which was developed from experiences she had growing up in an environment conducive to exploring the natural world and now as a dairy science major, which afforded her the opportunity to work with animals and have "real life" science experiences. She valued science and learning science when she got to experience it rather than just read about it from a book. Her career goal of being an equine veterinarian was also a large part of her community of practice as a science student because she was continually surrounding

herself with opportunities to work with animals, specifically horses, so that she would be prepared for vet school. In later sections describing the negotiation processes it will become even more apparent that her value of science and science in the classroom was not only a scholarly pursuit, but also very personal.

The Physician Assistant

Background. Ruth was the "PA" because she decided to participate in FOCUS during her last semester at Magnolia State and had subsequently made the decision to pursue a career as a Physician Assistant instead of a medical doctor. Even though she enjoyed her experience with FOCUS she definitely felt her place was in the medical field. She worked with Ms. Vail in a second grade classroom for one semester. Ruth grew up in a small town that had a Navy base in close proximity. She described her town as a small community that had many people who have lived there their entire lives. She noted, "it's a pretty small community but um, there is a lot of people that have been there my whole life. Because there was a Navy Base close by there were also a good number of people who came and went." She had a similar experience as Angela in coming from a small town to a large university. Ruth shared, "it was a pretty small town so when I came [here] it was really different." She felt the student population at her high school was diverse and when she came to Wallace she was pretty shocked at the economic affluence of many of its students. She described her town and it's diversity in the following way:

> I think we were pretty diverse because we [only had] one high school so everybody went to that school. There wasn't a whole lot of economic diversity, we're not a rich town […] so [when] I came up here that was a little different for me seeing all these kids driving their SUVs and Beemers and Mercedes, it's like the nicest car in my town and these kids are driving them and I'm like "okay" (laugh).

Ruth had a big adjustment by making the decision to attend a large university, not only because of its size but the economic affluence she saw in some of her peers. Actually, Magnolia State was not her first choice. She made the decision to attend this large university only after visiting the campus her senior year. She wanted to attend another university in the state because it had a medical college. Ruth had heard that many students who attended undergraduate school there had a better chance of getting into medical school. As mentioned previously, Ruth made the decision early in life that she wanted to be in the medical field. At the end of her senior year she visited both campuses and decided on Magnolia State because the town was much bigger and she felt she didn't want to attend school in a very small town. She was happy she made the decision and said, "I thought I might have a problem with it because there were so many students and I am from such a small town but it's definitely the place for me!"

Ruth, like most of the other student participants in this study, knew fairly early on in life that she wanted to be a doctor. She recalled her early interest in medicine as,

> My mom and I both remember in kindergarten that when everyone is like "I want to be a princess" you know um, I always used to say "I want to be a baby doctor" and I didn't know what they were called but I knew I wanted to see babies and fix babies all day long.

These early memories definitely stayed with Ruth. She simply stated that, "I have wanted to be a pediatrician and um, it never really changed." She identified herself as a caring and nurturing person that also had an interest in medicine so being a pediatrician just made sense in her mind. Her decision to be a Physician Assistant rather than a medical doctor was the result of taking Organic Chemistry. She struggled with it and it ultimately affected her grade point average enough that she wanted to look for other options if she didn't get into medical school. She

explained her experience in Organic Chemistry and decision to change her career path in the following way:

> [Organic Chemistry] really chopped up my GPA and it brought it down a good bit and knew I really wouldn't be competitive […]. So I started thinking about all my different options and a friend of mine told me about her cousin being a PA and how she really like it and I had never even really heard about it so she was telling me more about it and I just started researching it and I was like "perfect" it really was perfect for me, that's when all that happened.

Ruth's community of practice as a science student was definitely affected by her decision to change her career path, especially in her last year of school. In Ruth's case, she was committed to being in the medical field and although she decided she could not pursue medical school she found an alternative path to fulfill her goal of working in the medical field.

Experience with science. Ruth's experience with science came mainly from a formal classroom setting. She recalled completing science fair projects in elementary school and the hands-on activities that she did in her gifted program, but not the specific details. She described her gifted program as, "I just remember the fun things […] on going projects […] in gifted program." She didn't remember too much about science in middle school and admits that until she reached high school her passion was for English and history. Ruth said that, "before [high school…] I wasn't really into science that much I was into English and history, really into history." It seemed that high school was a pivotal time in constructing her commitment to pursuing a medical degree. She explained that, "I liked biology and knew I was going to go into the medical field […], anything that had to do with humans and the system and how everything worked I was really into." She vividly remembered her anatomy course from her senior year and

how excited she was to actually get to do a dissection, even though many of her peers were disgusted. She said, "I loved it, absolutely loved it! We got to dissect a cat and everyone else was grossed out and I was secretly like "yes", so that was awesome!" Thus, Ruth's experience in high school with science, particularly with anatomy, definitely informed her community of practice as a science student. It seemed that anatomy class helped her solidify her commitment to the medical profession.

Moving from her experiences in high school to the university setting Ruth found the work of a science major to be both rewarding and challenging. She felt very challenged in her course work, especially Organic Chemistry, but liked the idea that she had made it through a rigorous program. She described this challenge as, "I think the one thing that keeps me going […] is that I know it is kind of a harder major." Ruth perceived the science major as challenging not just because she had experienced it but because peers made comments about it as well. She explained, "when I tell people that I am a science major they sort of say like 'oh that's got to be tough'." She had a sense of pride that she was a science major and felt she had accomplished something by obtaining this degree and said the following:

> It makes me really proud, it makes me feel like I have really accomplished something […], I am really proud that I am a science major and […] that I have made it through and I can actually have this degree and be proud of it.

The pride she felt in being a science major informed her community of practice as a science student. It was not just a science degree that she had obtained but a goal some of her peers viewed as difficult to accomplish.

The frustrations of being a science major for Ruth were primarily focused on Organic Chemistry. This was the course that caused her to change her future direction from medical

school to physician assistant school. She also felt that she had to put in much more time studying than her peers in other majors. She commented on the frustrating aspects of being a science major and her comments definitely centered on the challenges of Organic Chemistry and the number of tests she had to take. Ruth felt that being a science major challenged her more than if she would have chosen another major. She described this view as, "I feel like what we do is a little bit harder." Ruth felt that sometimes people didn't understand the amount of time science majors dedicate to their studies and what it took to succeed if you wanted a science degree. Her comment was, "[it…] kind of frustrates me when people try to complain about what they have to do and their busy schedule." Ruth's community of practice and her commitment to obtaining a science degree were not only founded in her own sense of accomplishment but how her peers viewed her accomplishment as well.

Teaching experience. Most of Ruth's teaching experience, prior to FOCUS, was in a church setting and on mission trips. She was a Sunday School teacher at her church back home for two years and worked with three year old children. She enjoyed the experience because she was able to work with young children and said that, "I liked it because they are little and I like little kids and their fun and they're the good age where they would listen and still want to play." Even though she had a positive experience working with children in her church, teaching had never crossed her mind as a profession. She had always had an interest in the medical field and thus, teaching had not been viewed as an option for her. Because her roommate was an early childhood education major, upon entering FOCUS Ruth had an interesting perspective of what elementary classrooms were like today. She focused much on discussing the potential obstacles she might be presented with upon starting the program. Ruth, prior to starting FOCUS, had ideas about the diversity of the student population in elementary schools today and the challenges of

teaching students with learning disabilities and other social factors that might affect a child's academic performance. She explained,

> that would be hard if your kids are dealing with something at home and you have no idea and you don't know what to say or how to encourage them or if they have a learning disabilities that would be really hard if they are autistic, they could be disruptive in the classroom and disrupting other students. Also just not favoring certain students like the one's that are being bad, giving everyone equal attention and not trying to favor any particular student.

Because her roommate was an Early Childhood major, Ruth had maybe a better idea of what to expect when she started the FOCUS program. The information she received from her roommate also motivated her to participate in FOCUS, which will be discussed in a later section.

Summary of commitments. Ruth's community of practice as a science student was defined by her commitment to pursue a profession in the medical field. Even though she did not plan on going to medical school she had found another route to pursue her goal. Ruth, out of all the student participants, was the most unlikely to think about teaching as a career choice. Her identity was determined by her pursuits in medicine and teaching had never crossed her mind as a viable option. Most of her science experiences came from the classroom and were most positive in high school when she had the opportunity to connect her interest in medicine with science in her anatomy course. Because she had a roommate who was an education major she probably had more insight about elementary schools than the other FOCUS students and in this way her community of practice was perhaps a little more developed in terms of her knowledge of elementary education compared to the other participants. Through the negotiation of this

experience readers will see her transformation of student to teacher and how this influenced her future career goals, if any.

The Veteran FOCUS Student

Background. Ann had participated in FOCUS three times prior to the start of this study, and this was her fourth and final semester in the program. She had worked with the same first grade teacher, Ms. Smith, for all four semesters and was graduating in May. She had plans to attend dental school the next fall. Ann grew up in a small town in Georgia and made the comment that her entire family, immediate and extended lived in the state. She was the oldest of four children; her mother was a pharmacist and her father was a general surgeon. Although she had decided to attend dental school she had been brought up by parents that chose science professions, and as will be explained, this definitely had an influence on her decision to choose a medical profession as well. She attended a small private school from kindergarten through high school. Ann explained, "I graduated with 24 people in my [high school] class." When she started thinking about applying for college she knew she wanted to be either pre-dental or pre-med but choosing a school was a little more challenging. She didn't want to go to a university as large as Wallace so she started out in a different state, at another institution but transferred her junior year. The other university was eight hours from home and she wanted to be closer to her family. She liked Magnolia State but remembered her first semester on campus and being overwhelmed by the size and amount of people! She explained, "I lost my car in the parking deck, it was overwhelming and the buses I still, I only ride […] one, because I am still afraid to venture out." Even though the experience of transferring schools was a bit overwhelming for Ann she enjoyed her two years at Magnolia State. After graduation in May, Ann planned on starting dental school in the fall. At the time of this study she was still waiting to hear if she had been accepted to

dental school. Ann described the waiting process as, "I applied to dental school […], it's the only one in [this state], and I am still kind of waiting on that so we'll see."

Experience with science. Ann's experience with science throughout her education was definitely memorable, but like many of the FOCUS students it was memorable not so much for the science but because of particular teachers. She had fond memories of her 4th grade teacher who engaged the students in many hands-on experiences; Ann was actually able to use these experiences in her own teaching in FOCUS. She described a positive experience with a teacher as: "I was in 4th grade with [my teacher] and the foot print on the moon, [… and] I always just remember that and I actually used that for one of my best lessons in FOCUS." Before 4th grade Ann did not recall very much science in the classroom. She remembered her 4th grade science because she felt the teacher really enjoyed the subject and thus engaged the students in science activities. She recalled, "I can remember [my fourth grade teacher] because she just liked it." This theme of the teacher being excited and engaged in science followed Ann into middle school where she had a teacher that appeared to be excited about science teaching and learning. Ann's reflection on this experience with science was, "in middle school I loved it because of our science teacher and I just really loved her and she did things like getting outside and looking at stuff outside." In high school Ann yet again felt that it was her science teacher that made the class. In her 12th grade Biology course she was able to take a trip to a coastal island in the state and actually did experiments on location. She described this experience in the following way:

> We went on a field trip in the 12th grade Biology, and she took us to [a coastal island] and so we studied stuff there and got to look under the microscopes and do the nets and see what you got and then we did the Excel graphs and that was really neat.

Ann did have many opportunities in science throughout her education and she really pointed to the important role her biology teachers played in this positive experience. She felt that her science teacher in high school had much to do with her growing interest in science. Ann explained that, "[my high school science teacher is] just like this fountain of knowledge. I think she had a lot to do with my interest in science." Ann's view that her interest in science was directly related to her high school biology teacher definitely informed her community of practice as a science student. She placed value in the person and their ability to make the subject interesting. In terms of the subject of science she really enjoyed anatomy, which is similar to most of the other FOCUS students in this study. She simply stated, "anatomy, I really liked that." She really enjoyed the opportunity to dissect and learn about the parts of an animal. She was always in small classes because she attended a small private school, and recalled having to do oral quizzes with the teacher in anatomy. Overall, her science experiences leading up to college were positive and she had many opportunities to do hands-on science and engage with the teacher, obviously something she valued.

Because Ann went to a different university her first two years her experience with science in college was reflective of both universities. She selected science as a major because she thought it made the most sense in terms of preparation for a health care profession. She described this decision as, "well, [science] was always my favorite subject, so I always knew I wanted to do something like health care profession and that just opened up to the science major." During her freshman year she really enjoyed her Honors Biology course. She liked it primarily because of the small number of students and the discussions they had during class. Part of the course was designed to have students read science articles and then have open discussions about them in class. She felt lucky to have this experience because she knew that the typical freshman biology

course at Magnolia State usually had several hundred students. She explained, ” I just loved the biology. There were only 50 or so people and I think freshman biology here has hundreds, so [the professor] got to know us, and we also had [opportunities] for discussion.” She also really enjoyed the laboratory component of the course that was taught by a graduate assistant. Again, she pointed to the instructor as being the meaningful part of her learning experience, much like her experience in high school with science. She described her fondness of the course and instructor in the following way: “ I really liked the lab, and the lab TA was probably the best person you ever met, he made it so fun so interesting.” Ann definitely talked about her experience with life science but chemistry was a science subject she was glad to complete. She noted, “chemistry is probably my least favorite thing.” Like the other FOCUS students in this study Ann had to take several semesters of chemistry and organic chemistry but noted that she never really felt comfortable with the subject. She could not really explain her dislike of the subject but noted that she never felt very confident in her ability to master the material or know what exactly to do in the labs.

Ann’s experience with science outside of the classroom was very unique because she had the opportunity to go on a mission trip for several summers, where she worked alongside an ophthalmologist. She explained, “I’ve been on a mission trip the last three summers to Jamaica with ophthalmologists so that’s definitely science.” She had the opportunity to shadow a medical profession in action and learn about eye care and health. For Ann, this was definitely an experience that shaped her community of practice as a science student because she was not only able to help many people that could not otherwise afford eye care but was also able to observe cataract surgeries. She described this experience as,

> occasionally I got to watch the surgeries so like a cataract surgery and I didn't know that they are like the way they are, it literally takes 15, 20 minutes and then the person just has to wear the patch and the next day they can see, it's unbelievable!

Being able to witness surgeries first hand and helping people regain their vision so quickly was definitely amazing for Ann. She also talked about her experience with the ophthalmologist allowing her to hold the removed cataract in the following way:

> I was like this was the thing that causes this person to not be able to see for so many years and now he removed it and now they are going to be able to see, and it's just such an awesome thing.

This experience in a way reaffirmed Ann's commitment to science and her pursuit of a medical degree.

In addition to Ann's experience in Jamaica she had also participated in an apprenticeship with a dentist for two years and really enjoyed having the opportunity to learn about the field before going to dental school. She also shadowed her father, a general surgeon, and spent time in a pharmacy with her mother, a pharmacist. She explained that, "I definitely looked at everything before I made the decision." Ann had numerous opportunities to see a variety of different medical professions. With all these opportunities she decided on pursuing dentistry. After shadowing her father in general surgery she felt the job was too stressful because someone's life was always in your hands. Ann explained her contemplation between being a medical doctor or a dentist as, "with Dad it was almost too much like the person's there and their whole stomach is open and I think I need somewhere in the middle so that's how I decided on dentistry." With having two parents in the medical field Ann made the decision she wanted to do something in the health profession in high school. She commented, "it was like 11th and 12th grade and I had

always seen mom and dad, and oh, I want to do something like that' and ended up loving it which helped too." Ann definitely was influenced by her parents' choice of profession but had decided to take a slightly different place and attend dental school. Ann had many experiences with science in her life-time and they all seemed to be positive. She could never remember not liking science and had known for a long time that she wanted to work in the health care profession. Her community of practice as a science student was that of longevity because she had taken many opportunities to explore her interest in science and more specifically in health care. Her commitments appeared to lie in getting into dental school.

When asked about what she thought was rewarding about being a science major Ann explained that knowing how everything "works" was very satisfying. She felt that through her biological science major she had background knowledge in many different areas. Overall her science experience in college had been rewarding but she did have problems with the "weeding" out of students early in the program. She really enjoyed her upper level courses and felt like if more people could stick with it they would as well. She explained her reasoning as,

> I hate the way that the curriculum weeds people out, like you give it a try, I feel like the first two years are harder than the last two. And I think it's kind of they are trying to weed people out and wish they didn't do that which I guess they have to but you know in a way it's kind of discouraging and I want to be like if you just stick it out it's so much better, like the classes now are so interesting.

Unlike many of the FOCUS students that felt the science majors were very competitive and cut throat Ann somehow had removed herself from that and felt that her friends in the sciences were all friendly and willing to help each other. She acknowledged the fact that she had to study a lot but didn't see the "cut throat" nature of the science major, she didn't feel that competition other

participants had mentioned. She indicated that she had to study a great deal but placed emphasis on time management. She noted, "I definitely have to study a lot but I know people will say it over and over it's all about time management and it really is about time management."

Teaching experience. Ann's teaching experience prior to FOCUS was only as a vacation bible school assistant teacher in high school. She didn't really feel like it was teaching, especially because at this point she had been in an elementary classroom for four consecutive semesters. She explained that, "I wasn't the teacher I was just helping and then I think that's it, I have never really taught anything until now." Ann enjoyed Project FOCUS, as reflected in her continual participation but had never considered teaching as a career for herself. She believed that because of her FOCUS experience she realized the need for similar programs and hoped to do volunteer work in elementary schools later in life. Ann was definitely one of the FOCUS students that could not say enough good things about the program and its affects on her personally.

Summary of commitments. Ann stands out from the other participants because she had been participating in FOCUS for many semesters. Even though she did not plan on pursuing a career in education, it was interesting that she was, at one point, considered taking a teaching position if she did not get into dental school. Later, how she negotiated the FOCUS experience with her partner teacher will be examined.

The Teacher, Maybe

Background. Kelly was a sophomore biology and cognitive science double major who was born in Ohio but moved to the South at an early age. She grew up in a suburb of one of the major cities in the state. She came to Magnolia State because she wanted to go to a large school and because of the tuition waiver students received if they maintained a B average in high school. She explained her decision to attend Magnolia State as,

> I guess what brought me to [this university] was […] I really wanted to go to a big school and just kind of felt that it would be the best college experience and you can't beat the price, so I came here.

In this study she was portrayed as "the teacher, maybe" because she was the only student participant who indicated on her application that she was thinking about pursuing a career in education. She started thinking about teaching as a potential career choice because she felt it would fit well with her future plans of having a family and not having to take six additional years to complete medical school. For a long time she thought about being a college professor but it was only recently that she started to consider a career in elementary school teaching. She explained, "I was always like a college professor would be cool because I could do research at the same time and deal with people who are really interested, of course." Teaching was definitely a profession she had been considering for quite some time, but she decided to declare her major as pre-med and put the idea of being a college professor in the back of her mind. Kelly's remarks were, "I kind of dropped the idea when I decided to be pre-med." Because Kelly was considering teaching as a profession, she was motivated to participate in FOCUS to see if she actually enjoyed teaching. Kelly's community of practice as a science student began to unfold as one of uncertainty. She was different from the other FOCUS students in that although she was a pre-med major she was willing to explore other options and was not completely sold on going to medical school. Her commitment to having a family and finding a career path that did not involve six more years after undergraduate school also informed her community of practice; she was willing to change her career path for other parts of her life.

Experience with science. Kelly's experience with science was mostly located in a classroom setting. In terms of all her school experience she described liking elementary school

the most. She commented, “my best um, school like experience was elementary school.” She credited this positive experience not necessarily to science, but to the gifted program she was enrolled in from third grade on. She explained that, “the gifted class always got to do really neat things and go build things and do fun stuff I had a lot more opportunities in the gifted program.” Her first memory of school science was fourth grade. Her comment was, “fourth grade was the only science I really remember from elementary school.” She felt that her experience with science in fourth grade involved many hands-on experiences. Kelly described these hands-on experiences in science as,

> I remember my fourth grade teacher she did things like she brought in plants and um, we got to look at different fungi and stuff like that. From what I remember from fourth grade [science] it was more hands-on.

Kelly suggested that she did not remember science before fourth grade because there may have been fewer opportunities to do these hands-on activities. She stated, “so, maybe that’s why I don’t remember anything else [from other grades], maybe it was more information.”

Moving on from elementary to middle school Kelly vaguely remembered science; however it was her gifted science class in seventh grade that stood out as a positive experience. She explained that, “I remember science in middle school but I am not sure anyone has a good experience in middle school ever (laugh).” Kelly felt science in the sixth grade was really boring but seventh grade, and the opportunity to be in the gifted science class really made a big difference. She described this difference as, “it was really hands-on and [we] got to do a lot of fun stuff like growing bacteria cultures and stuff like that, stuff that I wouldn’t even think middle school people did!” Kelly’s experience with the gifted program in elementary and middle school were very positive. Her community of practice as a science student was informed by her

experiences in the gifted program, where her initial interest in science was able to form. One could question if Kelly would have chosen to pursue a degree in science without the experience of being in a gifted program.

Kelly went to a large high school and recalled more science and lab experiences but few specific details of those experiences. She tended to enjoy the life science courses she took more than physical science and explained that, "ninth grade it was physical science, it was pretty boring. I just don't like physical science." She also took chemistry and physics during high school even though those courses held little interest for her. Her biology courses did make an impression on her and she remembered the specifics of every dissection she got to do. She recalled that, "each division we would dissect something. […], I think the biggest we got was squid and […] and we also had some plant ones' with microscopes." She made the decision to not take AP science courses her senior year but regretted the decision and the lost credit, which made it necessary for her to take them in college. Her decision not to take AP courses was based on her feeling that they would be really hard. It was widely known at her school that the AP teachers were good teachers but the courses were difficult. Kelly questioned her decision and said, "for some reason I thought if I took the easier AP's and got credit for them then it would be easier for me, but now looking back on it I wish I would have taken them and gotten credit for the harder classes." She felt that if students were serious about "making something of themselves" after high school they were typically in the sciences. She said the following:

> […] I have had a lot of friends [in high school] who you know were really into science, kind of in high school when I was there, there was definitely a line between people who decided that they were going somewhere and people who decided they weren't going anywhere and most of the people that decided they were going anywhere were sciency

> […] that was the big thing in my high school yeah, I mean it was the most opportunity, it was the subject we had the most of the forward areas.

Thus, Kelly's high school experience and her view of science as a means to opportunity informed her community of practice as a science student. She had the experience of being surrounded with people interested in science and with a commitment to "make something of themselves." This view of people in science was possibly influential in Kelly's decision to pursue a science degree.

Kelly was just a sophomore, at the time of the study, and had not had much experience with science in the college classroom, but described her experience in chemistry, thus far, as being very dependent on the course instructor. The style of teaching made a huge difference for her. Her first semester instructor taught using power point and conducting labs that were "very lab manually." By contrast, during her second semester the instructor was a "really interesting teacher and very personable and taught from over head projector, which is better and his labs were much more designed to incorporate what we learned in class and the way he did lab reports was much better." She placed value on the instructor making the course interesting and with the opportunity to write a formal lab report instead of simply filling out questions in a lab manual. She felt the process of writing the formal lab report was very positive and gave her a sense of accomplishment. Kelly described this positive experience as,

> With the second professor we had to write like a 14 page paper, it was really, really hard but it was more interesting and I felt like I got more out of it and stuff like that. Yeah, things like that well we didn't um, reference outside sources so much but we did have a lot of data and a lot of explaining what went on and I felt like that helped us, um, with uh, learning the material and things like that, it just made us feel very accomplished and

when we got finished a really long paper. Some of us had never written anything that long before so.

Kelly put weight in the instructor's ability to help them actually learn the material. Even though it was challenging, she felt it was a much better learning experience. The instructional style and its relationship to learning informed Kelly's community of practice as a science student.

Kelly, like the other FOCUS students in this study, felt being a science major at Magnolia State was challenging, but also rewarding at the same time. She felt that she was pursuing a difficult degree and knew that it would help her if she pursued a career in medicine or another career in the sciences. Kelly explained that, "I like the piece of mind science gives me because I feel like I am doing something really, really hard and later I can use it or not and if I choose to not to I can go back and use it." She struggled with the time commitment it took to do well and the frustration that came with working really hard and not always seeing the grade "A" on the other side. She explained her frustration as, "I find it very frustrating that I do have to put some much time and effort into it*."* She sometimes worried that she put so much time and energy into studying, but it was still not enough to make the A's she knew she needed if she wanted to go to medical school. Kelly lamented, "you are so stressed when you are studying, because you get the concepts you get the stuff but it's just like it's not good enough."

Kelly's experience with science seemed to be heavily weighted in her experience inside the classroom. When asked about her experience with science outside of school she didn't see direct application to her life; she viewed science as a subject matter that was challenging and would hopefully help her pursue her interest in medicine or some other field of science. She described her long-standing interest in science as,

I mean you know I have really liked science and I have always thought it was interesting and something I really want to go into but as far as outside school you know, I can't really think of much.

Kelly's mother was a nurse and father an engineer, but they allowed her to choose her own direction in life. They also told her many times that she should go as far as she could in her education. Kelly explained, "well, [my parents] have always made it clear that they would be happy with whatever I wanted to do [but] wanted me to go as far as I could in school." Kelly was a pre-med major but really didn't make the decision to go that route until her senior year in high school. She thought about several different options for careers throughout high school, but visiting her mom at work at a hospital definitely influenced her decision. She really enjoyed the atmosphere of the hospital and knowing that people were constantly learning about medicine and how to help others– still, she had doubts about her career path.

Teaching experience. Kelly's experience in teaching prior to FOCUS came from being a summer camp counselor for two years. She enjoyed working with children and developed an interest in teaching in light of her wavering interest in going to medical school because of the time commitment. She chose to do FOCUS to test the waters of teaching and see if it was a good career fit for her. Kelly explained that, "I thought about going into teaching and stuff and thought this would be a great opportunity to like explore and see how I did with the kids in the classroom." She was already talking about marriage and what type of career would be compatible with having a family. Kelly was still planning on finishing her degree in biology but FOCUS was an opportunity for her to explore teaching without a large time commitment.

Summary of commitments. Kelly's admitted interest in teaching informed her community of practice as a science student. She was the one FOCUS student in this study that was not sure

about pursuing a medical career. She was committed to finding a career that offered time for family and felt that teaching might be a good option for her ideal life style and choices. Her community of practice as a science student was also informed by her experience with science teacher role models. She placed value in the ability of an instructor to make the subject matter interesting and applicable to the students. Later, how she negotiated the FOCUS experience, in light of her existing community of practice as a science student, will be examined.

Science Students' Commitments as Indicative of Community of Practice

The community of practice of the science students was informed by their commitment to pursuing a future career in the sciences, especially in varying medical fields. The FOCUS students had an existing commitment to science, which was influenced by their positive experiences with science and their recollection of wanting to be in the science field typically from a young age. This commitment to science and science learning was linked to not only their experiences with science in formal education but outside of school as well. For example, Angela had always surrounded herself with opportunities to learn science and this definitely influenced her commitment to science as a future career. All of the FOCUS students had interests in science beyond their undergraduate career. Thus, their commitment to science was not one of looking into the past, although these experiences were influential, but how the degrees they were receiving, were going to help them gain access to future careers. They all spoke of the challenges of being science majors, in terms of the rigor of the discipline, but all felt it was a commitment they valued because it would lead them on a certain path towards a future in science related careers. Thus, their commitments and community of practice as science students were informed by a Discourse of the Future. The Discourse of the Future was developed from not only the ways FOCUS students talked about their desires to pursue careers in science but how they talked and

acted through their commitments to being a science student. This Discourse of the Future will become important put in the context of the community of practice of FOCUS and how stakeholders negotiated the experience.

Stakeholders' Commitments as Indicative of Community of Practice Come Together

When the Discourses developed from the commitments of the classroom teachers, FOCUS students, and principals were viewed together it was not surprising that misalignments were present between these different communities of practice. The principals had Discourses of Trust, Testing, and Respect. The classroom teachers had a Discourse of Science Teaching and the FOCUS students had a Discourse of the Future. It seemed that the principals' Discourse of Testing had a direct link to the teachers' Discourse of Science Teaching in that both these communities of practice, of elementary school and classroom teachers, believed in the value of science education for the elementary students but were also committed to doing well on the standardized assessments. The FOCUS students were coming in from the outside, the "new comers" into the communities of practice of the elementary school and teacher. They had positive experiences with science and viewed it as means to a future career but had very little experience as teachers. The classroom teachers were not planning on entering science related fields and thus may not have been as committed to the actual discipline as the FOCUS students. Thus, this Discourse of Trust in Project FOCUS became relevant because there were science students coming into the elementary classroom that were committed to science and teachers that valued science but also had many other commitments to manage. Also, the principals valued what the teachers told them. When the teachers said they wanted to continue the program then there was buy in from the community level, the elementary schools, to continue a program, that from the outside, seemed to be successful. Thus, the conditions for success seemed to be

apparent. To understand how the commitments, communities of practice, and Discourses of the stakeholders influenced the negotiation of FOCUS an explanation of why stakeholders chose to participate needs to be explored.

Why Stakeholders Participated in FOCUS

The discussion above provided insight into why stakeholders chose to participate in FOCUS. The school principals emphasized that they chose to have their schools participate in FOCUS because they felt the program was a benefit to the elementary students and the classroom teachers. According to the principals, the teachers asked for a FOCUS student every semester and voiced their approval and desire to keep the program to their principals. Because the principals relied on the teachers to tell them about the program and its benefits to science learning for the elementary children it was important to know why the teachers themselves initially signed up for FOCUS. It was also important to know why FOCUS students signed up for the program to gain a more in depth perspective from their viewpoint as university students working in the larger community. In this section the reasons why the classroom teachers and FOCU students decided to participate will be explored.

Teachers' Wanted Help With Science Instruction

All of teachers participating in this study wanted help with science instruction and felt the FOCUS students brought in great ideas for hands-on science that they could not do themselves because of time and resource constraints. They also spoke to just the simple fact of having another "body" in the room to help individual students and the need for their students to see a new face in the classroom. Ms. Hart summarized her reason for participating in terms of the following: "I wanted some help with science so I was hoping some one else would have some ideas, um, and also because just having another adult means there's more individual attention

you know they can be more hands-on because there are more people to help." The simple fact that FOCUS students offered a helping hand to these teachers was a great asset because the teachers, with the exception of Ms. Roberts, the kindergarten teacher, did not have paraprofessionals in the classroom. From their perspective, anybody that came into the classroom to help was great! This also echoed how the principals talked about FOCUS. They felt that school resources many times had to be allocated to other subjects besides science and so a group of students that would be willing to help with science might provide some of the tangible needs science would not get otherwise.

Typically the teachers signed up for FOCUS because they heard other teachers talk about the program and the positive experience they had with it in their classroom and for the elementary students. Here again, as with the principals, the teachers relied on other teachers' comments about the program to guide them in their decision to have a FOCUS student. They trusted the other teachers and their experiences. Ms. Hart explained very candidly that, "honestly [I signed up] because the teacher I worked with last year she did it and said it was a great idea and also watching her student […] just watching her and the students and they would come back […] and they know their stuff, so I did it." It definitely seemed to be a "word of mouth" kind of thing around the school and this was the experience of the graduate coordinator as well. When FOCUS was introduced at a new school initially, only have four or five teachers would sign up. However, after the first semester, and opportunities for teachers to talk with each other about FOCUS, the number of them wanting to participate in the program would typically double or even triple. For example, at Cedar Elementary the program went from having five teachers the first semester to sixteen for the subsequent term.

After teachers had a FOCUS student for several semesters it seemed as though they developed a reliance on the program and wanted FOCUS to continue. There were close to ten teachers who had been involved in the program since its inception in 2002 and these teachers had a FOCUS student every semester. From the perspective of one of the veteran teachers it was not even a question of wanting a student anymore—it was a need. Ms. Smith said the following about FOCUS:

> I knew I needed to. You all, besides having a student teacher come, who are taught to be teachers, you all are the best thing we've got going on, period. Um, there was no doubt in my mind that I wanted you all, I've had one every semester but one and they're wonderful.

This need teachers spoke of not only came from the opportunities they felt the FOCUS students could offer their elementary students but the pressures they felt as teachers with time and resources. As discussed in relation to school context, it was apparent that these schools had to prioritize other subjects above science.

Reasons for Student Participation; Not Just a Resume Builder

The FOCUS students signed up for typically two reasons: they wanted to share their love of science with children and wanted the opportunity to work with children. Ruth explained,

> I was like, this is perfect for me, because I am a science major and I like science a lot and I love kids, I've been working a little bit more with kids, like some volunteering and stuff like that, I just thought it would be fun, not necessarily an easy class but something I would really like to do my last semester here because I am finishing up.

This was a typical response from most of the FOCUS participants. In the summer of 2007 data were compiled from the FOCUS student applications from 2002-2007. In the application

students were asked to identify reasons for signing up for FOCUS and close to 90% of the students stated that they wanted the opportunity to work with children and share science with them. As revealed through the student portraits, of the students that participated in FOCUS, close to 75% each semester had intentions of pursuing a medical profession. FOCUS gave them an opportunity to get out in the community and actually work with people that they might serve in the near future. As has been explained, many students never saw beyond the beautiful university campus and downtown area so this gave these undergraduates an opportunity to get out and actually have an experience with their community.

Some of the other reasons students in this study gave as reasons for participating in FOCUS included the opportunity to get out of the lecture style courses they had to take as science students and the idea that FOCUS would probably be a relatively easy class, maybe an easy A. It appeared that, for students, an underlying motivation to participate in FOCUS was the opportunity to be outside of the typical rigor of a science major and hopefully make a good grade. Angela provided some of her reasons for signing up in the following comment:

> Well um actually one of my friends […] was talking about what a great time she had and it was a pretty cool opportunity and of course she said it's not that hard and I was also like, oh I can pull up my grades from when I didn't know what I was doing last year, you know when I had no idea what college was about or what studying was and so that was kind of my first thoughts […]. Something different, exactly, that's what I am looking for something different then what my other classes are right now.

Dr. Wilson mentioned his surprise to find that some students viewed FOCUS as an opportunity to see if they wanted to enter the teaching field. This was also the case for Kelly, one of the four students, who participated in this study. She was considering teaching as a career

option in lieu of going to medical school. She wanted the opportunity to work in a school setting to see if teaching could be a potential career option. This was actually fairly typical in recent years as about 15% of the FOCUS students ended up pursuing teaching through teacher education, alternative certification, or Teach for America routes. Some students did participate as a way to "test the waters" of teaching before making a commitment to the field. While it was an assumption that not every pre-med student would have the opportunity to go to medical school, it could be that some of these students with pre-existing interests in teaching looked to FOCUS as a contingency plan. A later section explores how this became an option for one of our FOCUS students that had never considered teaching before participating in FOCUS.

Theoretical Interpretations: Addressing Why Stakeholders Chose to Participate in FOCUS

The purpose of this section is to describe how stakeholders informed each other's reasons for participation by returning to the theoretical construct of communities of practice. As mentioned previously, a community of practice includes people or stakeholders both at the core and periphery of the community; stakeholders have different roles in constructing the community of practice of FOCUS but all are meaningful and valuable in the learning process. As Fuller (2007) explained, "the overall concept of community of practice invites a focus on learning as a collective, relational and, in short, a social process" (p. 19). In this study the classroom teachers, FOCUS students, and school principals were all asked to explain why they chose to participate. At this community level the principals represented the reasons why the elementary schools chose to participate and to remain a part of the larger organizational level of the community of practice of Project FOCUS. The principals chose to have FOCUS at their schools because they felt their elementary students would benefit from the science knowledge the university students could share. They decided to remain a part of the FOCUS community of practice because their teachers

voiced interest in sustaining such partnership with the university and thus science students. As part of any community of practice members have to rely on the voices of others to make decisions. Here, the principals relied on their teachers and what they learned from the teachers about the success of the program, in the classroom, to make the decision to remain a part of Project FOCUS. The principals were at the periphery of the community of practice but were influential in making the decision to sustain Project FOCUS in their respective schools. Without the principals' consent to maintain the community of practice of FOCUS in their respective schools the program would have ultimately failed.

In addition to the voice of the teachers being heard by the principals, Dr. Wilson's decision to start Project FOCUS in the elementary schools came from these educators as well. Even though Dr. Wilson collaborated with a parent-volunteer to develop the program it was the teachers at Evergreen Elementary who were faced with the need for help with science in their classrooms. Thus, the voice of the teachers was fundamental in the development of the community of practice of Project FOCUS at the organizational level. As will be discussed below, this need expressed by the teachers, is what sustained the interest in having FOCUS at the elementary school.

The main stakeholders in this study, the classroom teachers and FOCUS students, had existing communities of practice that informed their reasons for wanting to participate in FOCUS. Their reasons for participating can be understood in terms of the larger community of practice of FOCUS. The reasons all seemed fairly simple and all stakeholders gained something from being part of the larger community of practice of FOCUS. There was continual recruitment of members into the community of practice of FOCUS from both the elementary school and university, which constituted success in terms of the larger organization. It seems that the

conditions were right for this type of program because the teachers got help with science and the university students had the opportunity to interact with the community outside of the university setting. All stakeholders, including the principals, agreed that FOCUS worked in this context. To understand how FOCUS was sustainable the combined commitments, communities of practices, and Discourses of all stakeholders needed to be placed in the context of how the experience was negotiated in the classroom setting. In particular, Discourses played an important role in illuminating the processes of negotiation. It the methods chapter the author described how Gee's (1999) notion of Discourses would be used in this study. Although ideologies are a part of how Gee (1999) presents his discourse analysis to readers the construct was not used to guide the analysis of this study. "Ideology can refer to a systematic body of ideas articulated by a particular group of people" (Storey, 1998, p. 3) Ideologies, as defined above were beyond the scope of this study and seemed to limit the ways in which the author meant to determine commitments the participants had in their respective communities of practice. Using the definition provided by Storey, ideologies represent a deep level of understanding of the systematic ways people in a community of practice talk or discourse about the group. The author for this study did examine the commitments of the individual participants and how they informed the larger communities of practice to which they belonged but did not intend to summarize or create a systematic or rigid set of ways in which they articulate their communities of practice. Although ideologies are seemingly important to communities of practice and Gee's (1999) discourse analysis they were not the focus of this study.

The following chapter explores not only how negotiation was carried out between the classroom teachers and FOCUS students but outcomes that resulted from the processes of negotiation and how they were informed by all stakeholders involved in FOCUS.

Chapter Six: Activities of Negotiation

The following five scenarios represent the activities of negotiation that occurred in the classroom between the classroom teacher and FOCUS student pairs. These scenarios are based on the experience of individual pairs as they participated in FOCUS. Each scenario is compared and contrasted in terms of the negotiations with the other classroom teacher and FOCUS student pairs that participated in the study to distinguish commonalities and differences that existed for the pairs in the activities of negotiation. The first four scenarios were used to depict the activities of negotiation that occurred between the first three pairs in the study and the fifth scenario drew from the fourth pair. The fourth pair was interesting in the sense that it provided insight into how collaborations between classroom teacher and FOCUS student did not always result in a positive experience for both parties.

These scenarios were also significant in terms of answering the second research question: "In what ways do stakeholders from various communities of practice negotiate FOCUS?" To answer the second research question, the negotiation scenarios were first constructed based on the commitments stakeholders brought to the experience and their existing communities of practice. What emerged from the scenarios were Discourses that informed these processes of negotiation. A discussion of the emergent Discourses will be described following each scenarios of negotiation. These Discourses helped to understand how stakeholders crossed their existing community of practice boundaries through the negotiation process and lead toward a discussion of the productive and unintended outcomes associated with negotiating FOCUS.

Scenarios: Activities of Negotiation

Scenario One: Role in the Classroom

For Angela and Ms. Hart their negotiation took many forms, but centered around their roles in the classroom. Over the entire year they worked together they each had to negotiate how they would interact together and with the elementary students. For Angela, her prior experience in teaching was fairly rudimentary; she had helped some in her church and through 4-H but had no teaching experience in an elementary classroom. Ms. Hart always wanted to be an elementary teacher and felt like she had made it when she got her first teaching job, her current position. Angela and Ms. Hart had to negotiate their roles by trusting themselves and each other. In the beginning, Ms. Hart saw her role as disciplinarian and stayed quite distant from the actual teaching of science while Angela was in the classroom. She viewed her role as classroom manager and didn't expect Angela to have the experience or knowledge of how to "control" an entire class of fifth graders when she started the program. Ms. Hart described her role as,

> I try to not interrupt, […] it usually works really well, of course, I control the classroom behavior as much as I can. [The FOCUS students] are not teachers, I don't expect [them to be good at classroom management] that took me years to get.

Throughout the entire experience Ms. Hart seemed to be the helping hand for Angela but was removed from the actual teaching of science. From time to time she would help students interpret science vocabulary while Angela was teaching. Sometimes Angela's vocabulary, built from her years studying science, was beyond that of fifth grade students. Ms. Hart commented that, "[for the students], if they look kind of like, huh, I don't get how it relates, I will put it in a different way." Ms. Hart described her role in the classroom as an added "resource" and "an extra set of hands" for Angela.

While Angela always held the role of science teacher while she was in the classroom she definitely looked to Ms. Hart for classroom management and did not have confidence in her ability to focus on the whole class. She acknowledged this was a problem she wanted to overcome, but it was a struggle because she would get really excited about the science content and then forget about the other aspects of being a teacher such as classroom management. Angela, the student that embodied science, revealed this through her talk about being in the classroom. She viewed a whole teacher as one that could negotiate not only the teaching but also observe all students at all times. Angela felt that she was yet to reach this point with her own teaching, but was definitely striving for this in her practice. Angela described how she felt as,

> I […] get really excited about what I am talking about or I am answering another question and I kind of go tunnel vision and don't watch everyone and so there could be something happening and if someone is asking me a question I will walk over to them [and…] I just kind of get focused on one person or one group. I am really bad at the discipline part of things.

Negotiation of their roles in the classroom did happen gradually over the year they spent together. Ms. Hart's gradual role shifted from that of classroom cop to assistant teacher. Her negotiation was built on the preface of respect and the admiration Angela should receive from the students. Ms. Hart said, "now I just feel like I am the assistant for her (Angela) when she is here. […] She is comfortable with that position because the kids respect her just like it's me." It appeared that Ms. Hart had to force herself to step back from the role of classroom manager for Angela to be truly successful and respected in the classroom. Ms. Hart realized that her role should be more than disciplinarian; she wanted to set an example for the children of what respect for other adults in the classroom should look like. Ms. Hart explained that, *"*[at first I was

thinking] I don't know how comfortable she is going to be, I don't know how comfortable the students are going to be listening to her, it was a mess [but I have let go now]." This notion of letting go was very important to their negotiation of roles in the classroom. Ms. Hart felt like "letting go" of questioning how comfortable Angela was going to be with the students and the students with her, allowed mutual respect to form and ultimately created a better experience for the students and Angela.

This idea of respect was very influential in how Ms. Hart carried out the negotiation of her role in the classroom. She reflected on her own ideas about what respect meant and concluded that it had to come from both the students and herself for Angela to become an effective teacher and not just an added figure in the classroom. She wanted her students to view Angela as the teacher even though she knew that Angela was not an education major. Ms. Hart had to negotiate how she presented herself in the classroom during FOCUS to help Angela achieve "teacher" status in the eyes of the elementary students. Ms. Hart was clear about how she wanted her students to treat Angela when she said, "they need to respect her decisions just as much and I don't want that and I don't want them to think that I am just this hawk ready to pounce on the prey, I want them to think oh she (Angela) is the teacher." Ms. Hart had to reflect on her own ideas about what it was to be a teacher and the trust she had to put in someone else teaching in her classroom for FOCUS to be successful. She said that, "I have gotten a lot more comfortable trusting that she will come up with […] everything we have needed to cover."

While Ms Hart negotiated her role of disciplinarian this allowed Angela to negotiate her role in the classroom as well. Both Ms. Hart and Angela had to negotiate internally for the external negotiation of their role in the classroom to take place; an important part of FOCUS as a lived experience. Angela then had to take the negotiation Ms. Hart went through internally and

translate that into practice. Angela discussed how she learned to not only focus on one group of students but learned to teach the entire class. She noted the trust she had to place in the students to be successful as a teacher and explained that, "I am learning to observe everyone, […] I am kind of learning to have eyes in the back of my head and also putting trust in the kids and knowing that they are capable of things." Angela moved from only being able to focus on one set of students to relying on herself as a teacher who had to pay attention to all students. It was a gradual process for her but the combination of Ms. Hart negotiating her role away from classroom disciplinarian to that of assistant to Angela negotiating her move away from just being the science expert to classroom teacher resulted in a more cohesive and positive experience for both of them. Angela felt that this sense of independence in the classroom came from the trust she had gained from Ms. Hart and the amount of time she had spent in the classroom, an entire year. She explained this process as, "I think I am more independent in the classroom because I am more comfortable and know the students more […]. I have had more trust put in me and been able to do things on my own and I am less dependent on the discipline coming from [Ms. Hart]."

In this partnership the stakeholders had to negotiate their roles in the classroom. The role in the classroom was an important part of FOCUS because in any program where there are stakeholders from different communities of practice working together they have to negotiate how they are going to interact with each other, and in this case, with the elementary students. This was an important part of FOCUS because each participant gradually realized what role they wanted to assume and actualized those roles in the classroom. For Angela, it was negotiating how to not only teach science but maintaining the attention of all students. For Ms. Hart, is was negotiating how to let go of a sense of control and allow Angela to not only become the science expert but also teacher. Through the interviews and observations it was apparent that Ms. Hart

ultimately relied on Angela to teach the entire FOCUS lesson. In classroom observations the researcher noted that Ms. Hart was usually always present; she helped Angela get materials, at times helped with classroom management, but she did not participate in teaching while Angela was there.

The negotiation of role in the classroom between Angela and Ms. Hart was used as an example because in all four partnerships there was evidence of this give and take, typically the classroom teacher allowing the FOCUS student to take on more of the teacher role. What differs is that Angela and Ms. Hart worked more closely together than the other four groups, Ms. Hart was a larger part of the teaching process than the other three teachers. Ms. Smith and Ann did not negotiate their roles to the extent of Ms. Hart and Angela, primarily because Ms. Smith was not present during the science lessons. Ann always took the students in small groups to another area of the school when teaching. Ms. Smith rarely watched the lessons Ann was doing with the children and relied on the elementary students to tell her what they were learning with Ann. In the case of Ms. Vail and Ruth their negotiation of roles was similar to that of Ms. Hart and Angela because they were in the classroom together. Ms. Vail moved from being in control of classroom management, to allowing Ruth to more fully experience the role of teacher. However, Ms. Vail would typically conduct individual assessments with students on the side while Ruth taught, something Ms. Hart never did. For Ms. Vail and Ruth their negotiation of roles was based more on the time Ms. Vail could spend doing other things in the classroom instead of engaging in the science lesson while Ruth taught.

Interpretation of Scenario One: Roles in the Classroom

In the first scenario of negotiation Ms. Hart and Angela seemed to both cross boundaries in terms of their existing communities of practice as teacher and science student respectively.

These boundaries were visibly crossed in the negotiation process through Ms. Hart removing herself from the role of classroom manager to more of a teaching assistant for Angela. Angela moved from relying on Ms. Hart to "control" the classroom to trusting herself that she could teach the entire class at one time. Ms. Hart's commitment to science education for her students became apparent in this negotiation of roles. She felt her students enjoyed having Angela, the "science expert" in the classroom and benefited from her knowledge. Thus, Ms. Hart wanted to ensure that Angela was able to share her science knowledge and not just control classroom behavior. For Angela, she wanted to share her commitment to science with the elementary children by teaching them valuable science lessons. Thus, their negotiation focused on how each stakeholder would enact their own community of practice and commitments to create the best classroom environment possible within the context of Project FOCUS.

The result was the emergence of a Discourse of Trust that came from both Ms. Hart and Angela. Ms. Hart had to trust that Angela could handle the class while at the same time give her students the science opportunities she felt could not offer at this point in her career. As noted earlier, Ms. Hart was a first year teacher and so she not only had to trust Angela to become a science teacher in her classroom but trust herself in making this decision. Angela had to trust herself and the elementary students. She had to recognize that she was able to maintain "control" of the class while at the same time, share her science knowledge with them.

The notion of legitimate peripheral participation, in the context of situated learning theory, is applicable to this scenario. By creating this Discourse of Trust Ms. Hart and Angela were able to both negotiate their roles in the classroom and cross the boundaries of their existing communities of practice of teacher and science student to create a classroom environment they were both satisfied with and convinced student learning was taking place. Ms. Hart and Angela

seemed, to at the least, move beyond that of just peripheral participant. It could be argued that Angela probably moved closer to crossing this boundary of practice from science student to that of teacher more so than Ms. Hart crossed from teacher to science student. By the end of their year working together Angela had assumed the role of teacher during FOCUS. Ms. Hart recognized the importance of hands-on science opportunities that Angela brought to her students but was still hesitant to assume a community of practice as a science student. Ms. Hart was involved in the teaching and learning process and saw the children wanting to learn science but it may have been her prior experiences with science and commitments to other subjects that ultimately created this Discourse of Trust but also limited her ability to move from a peripheral to full participant.

Scenario Two: Planning Science

Ms. Smith was committed to addressing the GPS for science. She described what she asked the FOCUS student to do as, "I asked my FOCUS student to teach lessons on the GPS standards." She left it up to Ann to decide how to plan for the lessons during FOCUS and never questioned Ann's lesson plans. Ms. Smith explained, "I allow my FOCUS student freedom in choosing the activity." On a rare occasion Ms. Smith would ask Ann to do a specific lesson and she was happy to oblige, never questioning Ms Smith's decision. Ms. Smith put trust in Ann's decisions to choose the lesson and activity. She simply stated, "I just trust her so much." This trust was a large part of Ms. Smith's discourse throughout the entire time she worked with Ann. They worked together for four semesters; Ms. Smith had worked with FOCUS students since the induction of the program in 2002. This trust even went further in that Ms. Smith was rarely in the room when Ann was teaching. Ms. Smith relied on students relating to her what they had learned with Ann. Ms. Smith also relied on Ann to select appropriate hands-on activities, as her own

science teaching was limited to the textbook and discussions. Ms. Smith described each of their roles in teaching science as, "so I teach from the book and draw on their experiences, and then [Ann] does the hands-on things."

Ann echoed this feeling of freedom, describing the only constraints Ms. Smith placed on her planning as the need to stay within broad categorical topics—the rest was up to her. Ms. Smith provided Ann with the standards that needed to be covered and then it was up to Ann to create a lesson. She would use the Best Lessons that previous FOCUS students had submitted each semester to guide her construction of lessons and also thought about how the particular lesson would work with first grade students. She also used her experience of being in the same classroom with FOCUS for a year and a half prior to the semester of this study to guide her decision of what to plan to teach. She explained her planning as, "[Ms. Smith…] gives me the broad categories of what they need to learn, […] the standards and then I just decide, oh, I think this will be fun or oh this worked last year or I saw this on the Best Lessons and I think it looks good for first graders." Because Ann had experience working in first grade she also used lessons that had been successful in previous years.

Ann was left in charge of really all the planning from day one. She described her process of planning as, "I try to find something on the topic that she (Ms. Smith) gives me. Usually the first day I just try to introduce something, like tell them characteristics, it's more kind of like talking and maybe they draw it and then the next time I try to do something fun and hands-on." Ann approached her planning in this way because she felt if she didn't introduce a topic before students did an activity the children would not understand the material as well. She made this decision herself and felt it worked best for her students. She didn't come to this realization over night. After teaching for four consecutive semesters this is how she came to view her best

teaching practices—introduce the topic first and then do an activity. In all the researcher's observations of Ann, this was what she did. She really wanted her students to understand the material and felt that they needed some background information about the topic before they did an activity. Again, Ms. Smith did not advise her to do this because she was really not part of the planning process. Ann developed her own planning style and how she would present the material to the children.

Even though Ann had control over the planning when she taught science she knew that Ms. Smith did science when she was not there with the class. She was glad Ms. Smith taught science as well because she had heard other FOCUS students talk about science not being in their classrooms when they were not there. Ann explained that, "hearing other FOCUS students it sounds like [science is missing], but I don't know Ms. Smith might be more of the exception because she always incorporates science or anything that I talk […] but hearing other people [in FOCUS] it sounds like that's not the case for most lower grades." From Ann's experience talking with other FOCUS students she felt fortunate that Ms. Smith actually did science with the students when she was not there, even though science was usually taught through reading when taught by Ms. Smith. Here again, Ms. Smith's commitment to children learning to read was evident. Ms. Smith felt reading was very important for students in the first grade and so she integrated science into her reading; reading was the key for success in her mind. Ms. Smith summarized the link of reading to science as, "we can learn so much about science from reading, they just get so much from reading so that's my focus in first grade. […] If a child can read well, he can succeed in any subject."

Going beyond the tangible elements of planning, Ms. Smith had to negotiate the groups of children she would send to Ann for science time. Ms. Smith grouped her students by reading

level and so Ann had no choice but to teach the students in these already existing groups. Ms. Smith explained her grouping process as, "my kids are grouped in my room by ability, by reading groups, and so she (Ann) just takes a group at a time, we are rotating all morning, teaching in small groups, even when she is not here, so she takes the group that we are not working with." Ms. Smith built her daily schedule around these groups and never gave Ann the option of teaching the whole group or regrouping students. Ms. Smith had always done it this way and even when Ann was not there taught mainly in small groups based on reading level. In the semester of this study Ms. Smith had what she described as an unusual class because there was ten gifted students. As Ann rotated through the groups many of the children from the first and second groups left Ann's class to go to the gifted class. When the third group went to Ann Ms. Smith felt this was the time she could get her busy work done for the day. Ms. Smith explained that, "when they go with [the gifted teacher] and Ann takes her group, I am left with two children, so that's when I get all my busy work done, it's the only time of the day." Thus, Ms. Smith's planning of how the groups would cycle through Ann's science class was a logistical solution for her to get work done that she did not have time to do any other time of the day. Part of Ms. Smith's negotiation of planning was built around finding time to get other work done when most of the students were outside of the classroom, either with Ann or at their gifted class.

Even though Ann was given authority to plan for science, she at times, had trouble getting the children in the third group, the lowest reading level group to listen to her and behave as she would have liked. She would get frustrated with trying to teach them the same amount of content as the first two groups and questioned how Ms. Smith actually set up the groups. Ann said the following about the groups: "we have talked about the groups, because I think it's kind

of interesting, those are the people they are with everyday cause they do everything in groups." She never asked Ms. Smith to change the groups but through her negotiation of planning for her lessons she started to question the dynamic of the groups and if they were the best learning atmosphere for all the students. Ann had the idea that, "you know so maybe if you could switch the groups up, so that could make it a little more challenging cause not everyone is on the same level." She relied on her experience of seeing one student in particular move up a reading level and thus into another group. She was amazed at how his attitude changed and she could actually get him to listen and felt that he was learning much more. Ann explained this change in the student as, "I told you that a [certain student] moved from the third group (the lowest reading group) to the second group and it was totally different cause like when he was in the third group he would just say I can't [… and now] he is doing really well." She maintained this questioning of what would happen if the groups were changed such that they were not based on reading level throughout most of the semester. Ann posed the question of, "I wonder what it would be like if you could mix them all up and see and even like what would that first group (the highest reading group […]. I think they would be really surprised at how much we don't get done in the third group like we do in their group." She battled with her negotiation of planning not in terms of just what science to teach but how each student would be best served. Because Ann had been working in the first grade classroom for four consecutive semesters she had begun to move past just how to negotiate the planning of science to consider how to negotiate the best interest of the children while planning for science and where that balance could be struck. Ann described this challenge as, "how do you find a balance, but I want it to be fair you know, cause the third group should have the same opportunity but if they won't behave enough where I can't get through the lesson."

This scenario represents the negotiation of planning that was very typical for the other classroom teacher and FOCUS student pairs. Both Ms. Vail and Ms. Hart also left the planning up to their respective FOCUS students, never really questioning what they were going to do or asking to see the plans before the day of the lesson. Much in the same way as Ann did, Angela and Ruth e-mailed their classroom teachers the plans they were putting together almost every time and throughout the entire semester, but rarely would the teachers question their plans or make revisions. Ann was the only FOCUS student that took small groups of children outside the classroom, the other two taught the entire class. It seems that Ann's negotiation of planning in terms of questioning Ms. Smith's decision to group students according to reading level, was something that Angela and Ruth never had to face in their own classrooms. They never had to reach the internal level of negotiation that Ann had to contemplate because they did not have the experience of working with small groups of children. Although they recognized the varying academic levels of their students they never taught them separately.

Theoretical Interpretation of Scenario Two: Planning Science

In this negotiation of planning science Ann was given the opportunity to move from a position as of a newcomer in the community of practice of a teacher, towards that of a full participant. She moved towards full participation in that she started to think about the best interest of the elementary students in terms of learning opportunities. Although she taught the small groups of students by herself she still relied on Ms. Smith to designate how the children would be separated. Thus, Ann was positioned some where between that of legitimate peripheral participant and full participant as a teacher because even though she was thinking about changing the groups she never voiced her concern or ideas to Ms. Smith. Ms. Smith removed herself from much of the tangible planning of science, leaving it up to Ann. Ms. Smith put trust in Ann to plan

science activities for the elementary children. This trust not only came from working with Ann for four consecutive semesters but from Ms. Smith's experience with Project FOCUS for the past six years. Thus, Ms. Smith was able to remove herself from her commitment to science for her elementary children because she had trust in FOCUS and its students because of many years of positive experiences with the program. Ann was the teacher and this became interchanged with her community of practice as a science student. Ms. Smith did reserve the right, as the classroom teacher, to group the students according to her preexisting reading groups, but in all regards of planning she placed trust in Ann to use the standards set forth for the science curriculum and develop activities that she felt were suitable for her elementary students. She had many prior experiences with FOCUS students and because these were all positive she gave the role of planning to the FOCUS student.

Because this pair worked together for four consecutive semesters there was a Discourse of Experience that informed their negotiation. Obviously, experience and thus, the Discourse of Experience, was not something they verbalized but it was their combined experience of working within their respective communities of practice and their shared community of Project FOCUS that helped it develop. There were parts of their negotiation that were internal, unreachable, but had formulated over the four semesters they worked together. For example, Ann, began to wonder if the way Ms. Smith grouped the students was actually the best learning environment for all children. This Discourse of Experience and questioning surrounding the negotiation of planning would have probably not have happened if Ann had not had many opportunities to work with the same teacher for such a long period of time. Also, Ms. Smith's trust in Project FOCUS and its students was based on her Discourse of Experience that would not have

developed if she had only been involved in the program for a short amount of time. Ultimately, Ann was left in charge of the planning for science while Ms. Smith remained at the periphery.

Scenario Three: Goals for Science

In the interviews stakeholders were asked about their goals for FOCUS. In asking questions about the negotiation of the FOCUS experience it was important to also include the stakeholder's ideas about the importance of science instruction. This was done to gain further insight into why they had certain goals for FOCUS and how they were negotiated over the course of the experience. This was also important in relation to Gee's (1999) discourse analysis, specifically the connection building task, where questions such as "how do connections help to constitute 'coherence'—and what sort of 'coherence' is in the situation?" (p. 112) are asked of the data. In addition, when questions were asked about connections made throughout the data, and the way stakeholders talked and wrote about negotiations during the experience, it was necessary to not only reveal the negotiation that happened in one type of episode but how these episodes together revealed the deeper levels of negotiation.

For Ms. Hart and Angela negotiating goals for science learning and teaching seemed to be fairly consistent through time. Although the goals were consistent, each stakeholder had to negotiate parts of their existing communities of practice and commitments to enact them in the classroom together. In the beginning Ms. Hart was quick to point out her goals for FOCUS as having someone do science activities and someone else in the classroom; she viewed it as a reward for the children. Ms. Hart explained the goals of FOCUS to be "basically just to do activities with the kids […] she (Angela) is like a reward for them, seeing a different face." Angela viewed FOCUS as an opportunity to work with elementary children and ensure science was fun for them. As mentioned previously, Angela came into the FOCUS experience with a

large commitment to science, and its applications to her life and future career goals really sculpted her community of practice of being a science student. Angela explained that, "[I think it's important to] teach students that science is fun and it's not just numbers and not just reading but it's actually being able to do something in an activity."

As Ms. Hart and Angela progressed together through the FOCUS experience they both began to talk more about what students were actually learning about science and they expanded their ideas of what this experience should offer the elementary students. Ms. Hart felt that FOCUS and the FOCUS student helped reach more students then she could as an individual teacher. Ms. Hart said, "it's nice to have her [Angela] explain the same thing in a different way because it reaches more learners that way." She wanted students to benefit from not only having another teacher in the classroom to explain things in a different way but someone, like Angela, who had a strong science background and thus, could answer questions her elementary students had about science. Because Ms. Hart felt that science was not one of her strong subjects she was glad to have Angela to answer science questions. For Angela it was learning that to reach the goal of science being "fun" she had to teach all different types of learners in the classroom, which further led her to recognize she wanted the elementary students to really understand the material. She reflected on her own experience at this age to assist her in the negotiation process. Angela shared the following about the type of science experience she wanted for her fifth grade students:

> [I want them to have] an interest in science and seek out information because I felt like in elementary school and towards middle school, science [was…] all memorizing, [and I] remember it was hard for me to memorize it without reason, [I want the students to have]

> that need to know more or that curiosity in science […] and knowing that science can answer this question or there is a way to investigate it.

Angela's original goals for her students and for teaching in the FOCUS program were to make science fun for the elementary students. As she moved through the experience she reflected on how these students would truly understand science. She brought in her own experiences as a learner to inform her negotiation of the goals for science and how she could accomplish them in the FOCUS program.

Another level of negotiation Angela went through for her goals in FOCUS was moving from what Ms. Hart wanted her to do in the classroom to thinking more about what students had learned about science and how to assess their knowledge. Angela explained her assessment techniques as, "I am doing more assessments, just making sure they do know and can put it down on paper, because verbally they are really good and can tell me different things when I am teaching and so now it's just a different dynamic then just checking up on them." This negotiation process was an illustration of Angela moving from her position as a legitimate peripheral participant to full participant. Lave and Wenger (1991) explained this transition as "a person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice" (p. 29). Angela developed her goals; moving from just thinking about how she could make science fun for the students to how she could make the learning experience meaningful for the elementary students. Angela explained, "I do think [my goals] have changed some what. At first, Ms. Hart wanted me to do things that are fun and that was something that I really strived for, and not that I don't do that now but I think they (the students) have gotten a lot more interested in science and they get excited when I come." Angela also negotiated how she assessed the children and used her own

experience in fifth grade to guide this decision. Angela commented on her assessment, noting, "it's not a structured test, just something kind of fun. I remember I loved when we got to do word searches and cross words and that's just something that is fun and makes sense. Yes, it is incorporating writing and paper so that's something that I kind of feel that I didn't do last semester." Here, the communities of practice of Ms. Hart, the teacher concerned about the elementary children being tested too much, and that of Angela, the science student that heard and saw the amount of testing these children experienced, intersected and the outcome was Angela finding ways to assess students without giving them a formal test.

For Ms. Hart the goals she had for FOCUS were negotiated through how Angela brought science activities to her students and how they were carried out in the classroom. In the beginning her goals were to have the FOCUS student bring science activities for her students but this changed as she recognized that science, particularly hands-on science, could be successful in the classroom. Ms. Hart explained that, "being able to see that the science experiments can happen in the classroom, because in a perfect world this would always happen and you would always do science experiments and [I have learned] that science lessons and experiments can happen and they don't always have to fail." Ms. Hart always had the goal of making science hands-on and activity based for her elementary students but until she participated in FOCUS, and saw the success of it in her own classroom, she was skeptical. She suggested that, "I have always thought to do everything hands-on but never knew how to make it possible […] so actually seeing it in front of me and being completely in the middle of it, just makes me know that it is possible […]." This change in Ms. Hart's goals for science and what she viewed as possible in the classroom was negotiated over the course of her time working with Angela. It was a case where she always believed in teaching science this way but needed evidence to actually translate

it into her goals for science instruction. In light of Ms. Hart's negotiation of goals for science she still felt reliant on FOCUS for science and activities based instruction. She voiced this reliance as, "I think of [FOCUS] as a support, a very needed support. I would fall if I didn't have it." Even though at the end of the semester the negotiation of her goals for FOCUS and science instruction moved beyond having someone come in to teach science, she still revealed that she had not assumed the role of full participant in the FOCUS experience; she still relied on the FOCUS student to bring in the hands-on science that she felt her students needed and by the end of the year, asked for.

In the negotiation of the FOCUS goals, and how to teach science, Ms. Hart and Angela gave each other a new perspective. For Angela it was learning that not only should science be fun, but as a teacher, you have to find ways to foster student understanding and actually determine if they are learning. For Ms. Hart, seeing science activities be successful in her classroom moved her from viewing FOCUS as a science supplement to learning that science activities are possible and successful. She still did not feel completely confident that she could do hands-on science by herself but the negotiation process of FOCUS goals and goals for science moved her in that direction.

Ms. Vail's and Ruth's negotiation of goals for science and FOCUS definitely resembled that of Ms. Hart 's and Angela's. Both pairs shared the goal that science should be hands-on and believed that was how students learn the most. Ms. Vail echoed the same views as Ms. Hart in that she saw that hands-on science could be successful in her classroom but still relied on FOCUS for these types of experiences. Ruth did not think about her goals in light of student learning as much as Angela, perhaps, because Angela participated in FOCUS for an entire semester whereas, Ruth participated only one semester. Ruth still viewed her goals in relation to

making science fun, and did not consider student learning as Angela did. Experience may have been a factor because in the partnership between Ms. Smith and Ann, Ann definitely started to consider her goals for science in light of student learning; Ann participated for four consecutive semesters. Ms. Smith's and Ann's negotiation of goals was similar to that of Ms. Hart's and Angela's because they all had goals to give students hands-on opportunities. The teachers relied on FOCUS to offer these learning opportunities for their elementary students.

Theoretical Interpretations of Scenario Three: Goals for Science

Ms. Hart and Angela negotiated the goals for science in terms of student learning. Ms. Hart viewed FOCUS as a reward for her students but also placed value in what students were learning through the lessons Angela provided. Angela eventually went from a commitment to make science fun for the children to making sure students understood the subject matter. She used her own prior experience with science to inform this process because she felt, at times, in her own education that she did not have a reason behind what she was learning. This process led them to both think about not only learning but how to assess learning. Thus, a Discourse of Learning developed out of this negotiation. Ms. Hart learned that Angela was there to help her students learn best through hands-on activities. Angela changed her goals to not only make science fun for the students but to actually make sure they were understanding the material and that learning was taking place. As stated in the negotiation piece, Angela really moved from a legitimate peripheral participant to a full participant in the community of practice of teaching when she made this switch. Lave and Wenger (1991) explain this transition as "a person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice" (p. 29). She crossed the boundaries of the community of practice of teaching and defined it in terms of science and learning for the

elementary students. For Ms. Hart it may have been more difficult to make the transition to that of full participant as a science student, and that really was not the intent of the FOCUS program. But, the experience and Discourse of Learning Ms. Hart subscribed to seemed to make her realize the importance of Project FOCUS in her community of practice as a teacher and her own classroom environment.

Scenario Four: Negotiation of Science and Testing

The negotiation activity of science and testing was not directly controlled by Ms. Vail or Ruth because testing, and the way in which teachers had to prepare for the tests, were mandated by the administration who were told what to do by the district, who were told what to do by the state. There were many decisions made about science and testing that occurred before the classroom teacher and FOCUS student negotiated science around testing. While the power of negotiation was not in their control they did have a voice in negotiating their feelings of how testing affected science and how this played out in the classroom during the FOCUS experience. Ms. Vail and Ruth both viewed testing as a factor limiting the amount of time for science and the learning that was possible. Their negotiation did not focus on how to include science in light of testing but rather addressed how testing affected their emotions about the lack of science. Their negotiation was the process through which they came to understand the limits placed on science instruction and learning because of testing; a learning process for both Ms Vail and Ruth.

Even at the beginning of the semester Ms. Vail viewed testing as a limiting factor for learning in general. In all discussions about education, testing always came up and was the biggest problem in education for Ms. Vail. She explained that testing is "my biggest complaint with education right now, we are just assessing them to death you know and I do understand the value of data […] but we are just reaching a point where we are assessing to tell the public we

are assessing them." Ms. Vail felt that more than science was being affected by testing, and that excitement about learning was being taken away from her students. Ms. Vail said that, "I feel so much of the excitement is being taken away [because of testing]." In addition to Ms. Vail's negative feelings about testing she also saw its affect on science well before the week of assessments. In her classroom, science would not happen for two months prior to the State exam unless her FOCUS student, Ruth, was teaching it during FOCUS time. She made her priority the preparation of students for the test, which did not include science. Ms. Vail's negotiation then took the form of relying on Ruth to provide science instruction, because it was not going to happen otherwise. Ms. Vail explained how testing influenced science instruction in the following comment:

> [The testing] probably affected [science] two months to six weeks before we actually took [the tests] cause we really cut down on our science teaching, we were mostly doing it when Ruth was here and when she wasn't we were doing CRCT prep, anything to get us ready […], it's like science instruction grinded almost to a halt […].

Ruth echoed these sentiments by the end of the semester. She had prior knowledge of testing and the lack of science in many elementary classrooms because her roommate was an early childhood education major. Ruth voiced her opinion on testing as, "I think if they backed off on the testing a little bit just let the kids be kids you know, let them learn and do it at their own pace." Although, Ruth participated in FOCUS to bring more science into the elementary classroom she found herself doing test preparation, not science, towards the end of the semester. She had to give up her goal of bringing more science to the elementary classroom in light of testing. Her view of testing and its affects on science, was not positive. Ruth put weight into the need for programs like FOCUS for science to be a presence in the classroom. She explained her

discontent with the lack of time for science as, "[…] even on the scheduling of the day science and social studies share an hour of the day and math gets two hours, I mean it is important to build those skills for the next level, but science and social studies share an hour? Every school needs FOCUS." Her role in the classroom as science teacher took on new meaning when she saw the limitations placed on science. She was not only aware of the need for science in the schools but placed value in programs like FOCUS, believing they helped to negate the fact that schools place more emphasis on other subjects.

Even though Ms. Vail and Ruth both had negative sentiments around testing it did not become a reality in their negotiation of science and testing until it came late in the semester. At this time Ms. Vail had to negotiate how Ruth spent her time in the classroom and because the CRCT was just around the corner she had Ruth help with test preparation instead of science. Ms. Vail said that, "Ruth has been doing prep all week! Yeah, she helped me do the prep and stuff I had typed at home on my computer and I was like here, here is the book, and you go along with the SMARTboard and do these lessons so we can cover [everything] before the test*."* Ms. Vail did not want to ask Ruth to help with test preparation but felt the students needed additional help preparing for the upcoming test. Testing became a priority, even though Ms. Vail and Ruth did not feel it was an important or positive factor in student learning. The choice was out of Ms. Vail's hands, and thus Ruth had to go along with the plan for test preparation, which did not include science the week leading up to the test.

Ms Vail's negotiation of science around testing was a large part of her justification for having a FOCUS student and the reliance on the program for the science she felt she could not herself offer students. The reality of her situation, where other subjects were higher priorities than science, led her to rely on FOCUS for science. She wanted people to know that,

"[…science] it's really lacking, it's really, it's really way down on the totem pole of importance and part of that goes back to what we were talking about, […] the focus is on the reading and math because that's what they are tested on and if something gets chunked out of the school day it's going to be science or social studies […]." She internalized how the school negotiated its priority for other subjects over science with respect to her own classroom. Ms. Vail viewed the sentiment of the school to be, "if [science] doesn't get done you know oh well, I got the reading, writing, and math done." Even though she felt science was important for her students, testing came first. She felt that science instruction was lacking but because of testing and there was nothing she could at this point except rely on programs like FOCUS. Ms. Vail explained her reliance on FOCUS as, "[Ruth] brings things that I probably don't have the time to do or wouldn't take time to do, so it's helping me and she is able to do some of the things [I can't do because of] resources that I don't have. [Before FOCUS hands-on science] was very limited because we just don't have the resources."

By the end of the semester Ms. Vail and Ruth's negotiation of science around testing reinforced the reliance on FOCUS for science instruction, specifically hands-on science. Ms. Vail really did not see her science instruction changing very much in light of the FOCUS experience. She still relied on FOCUS for the hands-on experiences and without FOCUS opportunities for her elementary students were very limited. Ms. Vail explained that without FOCUS, "[the science opportunities would] probably be very few. There would be a lot more watching something on the SMARTboard while I sat over there and did the assessments instead of somebody being there to lead them in an experiment or an investigation. There would be less hands-on stuff." Ms. Vail had to negotiate science in terms of her "duty" to assess students in other subjects and prepare them for the CRCT. Although she felt that science and hands-on

experiences with science were very important for her elementary students it did not translate into her making science a larger priority in her classroom and for her as a teacher. Thus, she relied on FOCUS to offer science experiences she felt her students needed.

This reliance on FOCUS for science in light of testing was also a large part of Ruth's negotiation and how she viewed the value of FOCUS for elementary schools. By the end of the semester, Ruth, having been exposed to the pressures of testing, lack of resources for science, and the time Ms. Vail used for individual assessment when Ruth was there felt that science would be very basic without FOCUS. Ruth argued that, "without FOCUS students, it's pretty basic, a lot of books, just straight out of the textbook." She viewed science, the type of science she wanted for the elementary children, hands-on and activity-based, to be dependent on the FOCUS student. Thus her experience in the classroom and negotiation of science in light of testing informed her view of the importance of programs such as FOCUS. She did not blame teachers for this lack of science; rather she blamed the larger school system for not providing teachers the resources they needed to do hands-on science. Ruth said that, "I just wish that they would have more resources for science and the teachers would be able to do more stuff […] but at the same time [this school] doesn't even have enough science books for every second grade student […] so asking for resources for experiments that are only going to last a day is kind of silly when they don't even have science books […]."

The way in which Ms. Vail and Ruth negotiated science, in light of testing mandates, resulted in them acknowledging it's negative impact on science instruction and learning. Ms. Vail had to do test preparation for other subjects and as a result so did Ruth. They both viewed science as an important part of the elementary classroom. For Ms. Vail the limitations were founded in a lack of resources and time. For Ruth her views were developed by the experience of

working in a classroom where testing pressures were high and science was the first thing to be cut from the day's schedule. They both saw the value of science instruction and learning but questioned how it could be actualized in light of testing. Their negotiation ultimately resulted in a reliance on FOCUS and what it could offer elementary students. Ms. Vail and Ruth viewed FOCUS as the answer or at least part of the answer to maintaining hands-on science in the elementary classroom.

Ms. Vail and Ruth's negotiation of science in light of testing captured the essence of how the other two FOCUS pairs carried out this negotiation activity as well. By the end of the semester all pairs viewed FOCUS as the answer, at least for the time being, to providing elementary students hands-on science experiences. The other two teachers spoke about their reliance on FOCUS in light of mandated testing. They also "cut out" science several weeks before the CRCT. The school principals emphasized testing as a priority. Although they did not necessarily agree with the test-driven attitude it informed both of the schools' overall discourse and ultimately affected what happened in the classroom. By the end of the semester the teachers and FOCUS students viewed FOCUS as an essential part of their science instruction. What would happen if FOCUS no longer existed in these schools? What would happen to science teaching and learning?

Theoretical Interpretations of Scenario Four: Science and Testing

Ms. Vail and Ruth worked in the classroom together, but Ms. Vail put trust in Ruth that seemed to overshadow her own development as an individual in the community of practice of FOCUS. Ruth took on more than just teacher of science but learned the pressures of testing and the affects it had on individual students. She assumed more of a role in teaching and learning about testing than most students. Thus, their negotiation resulted in a Discourse of Testing.

Reflecting back to the idea of boundaries in practice and communities of practice Wenger (1998) gave a specific example of "a teacher, isolated from other practitioners and immersed in classroom issues, ceases to be representative of anything else; and artifacts gain local meanings that do not point anywhere" (p. 115). In the same way, it seemed that Ms. Vail, although not isolated from other teachers, had a difficult time reasoning beyond the constraints she saw in testing; time she could use for individual assessments while science was being taught by Ruth. Instead of becoming part of the community of practice of FOCUS, and the aspect that included teaching science, she chose to use the time for doing other things, dealing with other classroom issues. Her values seemed to waiver between what she knew was good for the children and what she deemed as vital to accomplish during FOCUS time. "It is difficult to establish criteria for what is valuable at the fringes of established practices, and the burgeoning of promising new practices is not always easy to recognize because they do not fit well within existing regimes of accountability" (Wenger, 1998, p. 115). Wenger (1998) did not use the term "accountability" as it has been used to describe testing mandates but it was useful when thinking about how the teachers relied on the FOCUS students, not always as a way to learn about science instruction but as a way to fill a void that they could not do because of accountability in other areas such as reading.

Scenario Five: Negotiating Communication

In the previous four scenarios of negotiation activities the fourth FOCUS pair was not discussed because their stories of negotiation did not add much to the prior scenarios; thus, they were not included in the portrayals of how those negotiations played out in the classroom and between teacher and FOCUS student. In the scenario that follows their negotiation of communication is portrayed for readers to become familiar with what happens when a

partnership in FOCUS does not come to fruition. Their communication was negotiated in such a manner that neither teacher nor FOCUS student really had an overall positive experience compared to the other three pairs. This scenario, involving the negotiation of the activity of communication, is based on interviews conducted with both teacher and FOCUS student, informal conversations with both of them, and observations in the classroom.

When you walk into Ms. Robert's kindergarten classroom you get a familial sense of what a kindergarten classroom should look like. It's colorful, creative, and there is ample space for children to interact in a common place, the large mat in the center of the room. You observe children participating in dance, song, and group activities constantly. Ms. Robert's considers herself a creative person, a hobby artist, and this definitely shows through the classroom environment she has created for her children.

At the beginning of the semester Kelly was excited about the opportunity to work in an elementary classroom because she actually was considering teaching as a career possibility. She wasn't set on her pursuits of a medical degree. She talked much about the amount of school and time she would have to commit to becoming a doctor and she wanted a family. She thought teaching might be a good fit in lieu of staying in school for six more years after completing her undergraduate degree. She felt the teaching profession might fit better with the idea of having a family and said that, "I have been considering teaching […] and I thought it would be a great opportunity to see how it is […] and get some experience."

Ms. Roberts had a FOCUS student the previous semester and had nothing but good things to say about her. She felt that their relationship was positive because of their open communication. Ms. Roberts explained, "I think that's why it was such a good relationship because we did talk and plan and then I let her go and make some choices on her own and it just

worked." When asked why she signed up for FOCUS Ms. Roberts could not even recall if she knew it was a science program. She had just heard good things about FOCUS from other teachers and once in the program, really enjoyed having someone else in the classroom and someone to help with science instruction. Ms. Roberts' explanation for why she signed up was, "I think I remember thinking it was science but […] I remember [it] being a student and you've got to do these things as part of your grade and get exposure to classroom situations so I thought well let's give it a try and it was fun."

At the beginning of the semester things seemed to be working out well between Ms. Roberts and Kelly. However, much of what Kelly was doing was limited to reading the children a book about science. She was usually done with the lesson in about twenty or thirty minutes. Kelly always did her science lesson towards the end of the day and it seemed to be a very busy time for Ms. Roberts' classroom; getting through their daily routine, making sure students had time for their afternoon snack, and packing up to go home. Kelly was asked about the amount of time she had and what she wanted to do with science. In the beginning she would comment on the many times that Ms. Roberts neglected to tell her about an assembly they had to attend or the need to use science time to visit the library. The fifty minutes for science was cut down to about twenty or thirty minutes. This did not always happen and as the semester continued it seemed that Kelly had more time to do science. Why was she limiting her activities to typically reading a book or doing a SMARTboard activity? Interviews with Kelly suggested that she had problems getting information from Ms. Roberts about exactly what she wanted her to do. Kelly was, at times, frustrated with the lack of clear communication about what should be happening in the classroom. Kelly expressed that the experience in Ms. Roberts classroom was "kind of challenging in that I haven't been able to teach a lot of science […] and I really want to […] but I

don't want to mess up their curriculum." As the semester went on there was little change in the type of science that Kelly would do in the classroom. There were times where she would do more activity-based science with the students and Ms. Roberts would praise her for doing such things, but at the same time, Ms. Roberts would also say "that was great" at the end of every lesson. Kelly wanted a clearer line of communication with Ms. Roberts. Kelly simply stated that, "I wish we had a little bit more communication, I will e-mail her but […] I won't hear from her for a day and […] I just want to be more informed."

In interviews with the pair they never openly talked about what they wanted to change about the other's role in the classroom or how they would like to move forward for the rest of the semester. They would individually express concerns about their lack of communication and expectations that were not being met.

Ms. Roberts actually didn't speak directly about the lack of communication; rather, it was her paraprofessional, Ms. Davis, who brought up the subject. In a conversation with Ms. Roberts, she voiced her frustration with Kelly. She felt that she had to tell Kelly everything to do, which was a direct contrast from her FOCUS student the previous semester. She described her former student as always taking charge and creating activities for the children without really asking Ms. Roberts for advice. Ms. Roberts appreciated this and expected the same from Kelly. Ms. Roberts said, "it's almost like night and day, [my] two [FOCUS students]. [I just wish this semester she had] more planned out, [… sometimes] when Kelly came in she just basically read a book that I handed her and I thought, hmmm, is this a lesson?" So, from Ms. Roberts' view point Kelly was not taking the initiative to do things on her own like her previous student. At times, Ms. Roberts felt like she had to "spoon feed" Kelly in telling her what lesson she needed to do.

By the end of the semester Kelly and Ms. Roberts' discussions were reduced to Ms. Roberts simply saying do whatever you want to do and Kelly still being left without a clear picture of what that meant. Ms. Roberts still wanted to participate in Project FOCUS next year because she felt her kindergarten students got much out of having someone else to interact with them in the classroom. Kelly decided not to pursue teaching or really even consider it as a career option and explained, "I have kind of ruled out elementary school as far as teaching […] I feel like it would be taking a step back in my education." She never pointed to it as being because of her experience in FOCUS but she made comments about elementary teaching not being challenging enough. She was considering going to graduate school to study neurology and was starting to look for research experiences at the university.

This scenario brings up many important questions for discussion. From the perspective of the graduate coordinator responsible for FOCUS and the researcher of this study, nothing ever seemed to change, in spite of conversations with both Ms. Roberts and Kelly. What could have been done to help them both feel FOCUS was a success in the classroom and for the elementary students? Was it the role of the graduate coordinator to have an "intervention" with both of them together to talk through their communication issues and come to some sort of agreement? Why did Ms. Roberts choose not to confront Kelly and particularly, the graduate coordinator, earlier in the semester? To what extent was this experience influential in Kelly's decision not to become a teacher or consider teaching as a career option?

Theoretical Interpretations of Scenario Five: Communication

In the scenario above, Kelly and Ms. Roberts may have been impaired, not by crossing boundaries, but by failing to do so. The learning potential they had for this experience may have been limited by their lack of communication. Ms. Roberts brought her prior experience with

FOCUS and expectation of what the university student would do in the classroom to the semester she worked with Kelly. Ms. Roberts previously had a student that she described as "independent and self-sufficient". She had expectations that Kelly would be the same type of student and when Kelly did not align with her prior experience a boundary was created.

Not only did the notion of crossing boundaries become apparent in the negotiation scenario but also legitimate peripheral participation. Lave and Wenger (1991) proposed that this form of participation is a "place in which one moves towards more-intensive participation" (p. 36). Legitimate peripheral participation relates to this pair's struggle to communicate with each other. Neither of them found a way to move towards this more intensive participation and remained almost in the same form of miscommunication throughout the entire semester they worked together. Lave and Wenger argued that, "legitimate peripheral participation can be a position at the articulation of power or powerlessness, in affording or preventing articulation and interchange among communities of practice" (p. 36). Thus, for Ms. Roberts and Kelly their lack of articulation about their challenges of working with the other in the classroom setting ultimately inhibited their ability to interchange among their existing communities of practice and thus, a community of practice at the level of their partnership and classroom, did not fully develop.

Ms. Roberts and Kelly both came to the FOCUS experience with existing communities of practice of teacher and science student respectively but they were unable to find a way in which to interchange among those communities of practice such that each would come to full participation. Recall that Kelly had an interest in teaching and was using FOCUS as a form of apprenticeship to see if teaching could be a potential career path. Ultimately, her membership in the teaching community of practice was never developed because, from her view, her

communication and ability to share science with the elementary children was limited. Wenger (1998) says that, "practice is the source of its own boundary" (p. 113). Ms. Roberts may have still viewed Kelly as an outsider to the classroom experience. Kelly only was present during a small portion of the day, only a few days a week. Ms. Roberts may have felt it was not her role to let Kelly into the daily practices of the classroom. It may be that it was not worth her time to try to help Kelly become a teacher, because Ms. Roberts knew the FOCUS participants were not education majors. Because Kelly was maybe not viewed as a teacher it was easier for Ms. Roberts to let her continue doing science, even though she was not as happy with the outcome of Kelly's lessons compared to the previous semester. Wenger (1998) notes that, "even when interacting with an outsider, it may make sense to gloss over difficult points and not waste energy engaging them with internal issues" (p. 113). In the same way it may have been easier to keep Kelly at a distance and not bring her into the community of practice of a teacher that Ms. Roberts belonged to and thus, it was revealed through their scenario that the lines of communication failed. Their negotiation ultimately revealed a Discourse of Miscommunication. At the heart of their negotiation and why it ultimately did not result in a productive experience was the unbalanced nature of how they negotiated communication with each other in the classroom. In a developing community of practice "when some always produce and some always adopt—the local economy of meaning yields very uneven ownership of meaning. This situation, when it persists, results in a mutually reinforcing condition of both marginality and inability to learn" (Wenger, 1998, p. 203). In the same way, the end result for this pair was that they both kept each other at the margins of their communities of practice and a sustainable partnership was never formed.

The Productive and Unintended Outcomes: The Classroom, School, and FOCUS Contexts

In these analyses chapters the different experiences stakeholders brought to FOCUS were discussed. In Chapter Four the views of the FOCUS program developer, the graduate coordinator, and school principals were discussed to reveal the discourses they used to describe FOCUS and their involvement as stakeholders at the university and school levels. In Chapter Five portraits of the classroom teacher and FOCUS student participants were provided to familiarize readers with the communities of practice and commitments they brought to this experience. The reasons stakeholders, specifically the classroom teachers and FOCUS students, participated in FOCUS were briefly discussed. Finally, in Chapter Six, the activities of negotiation the classroom teachers and FOCUS students experienced were discussed through scenarios to answer the research question of "in what ways do stakeholders from various communities of practice negotiate FOCUS?" and to further understand how their commitments and communities of practice were involved in these activities of negotiation. In the section that follows, all levels of analyses are synthesized by using Gee's (1999) relationship building task. In addition, the ways in which commitments, Discourses, and communities of practice informed the answer of research question three, "what are productive and unintended outcomes associated with stakeholder's negotiation of FOCUS?" are discussed.

Trust and Respect for FOCUS

There seemed to be a level of trust in FOCUS that did not address what teachers may have gained from the program. One principal pointed to the notion that teachers were not using FOCUS as a learning experience but as a substitute for their own teaching responsibilities. Even though most of the teacher participants did teach science when the FOCUS student was not there it looked very different. They typically taught from the textbook or focused science around

reading. It was not only the classroom teachers that had commitments to the standards but also the school, as portrayed through the words of the elementary principals.

The principals felt FOCUS was a good program because their teachers asked for FOCUS students every semester. The principals relied on what their teachers told them about the program and its success in their individual classrooms to keep the program going in their individual schools. There was great respect for the program in the sense that no one challenged the need for FOCUS students to have more knowledge of how to teach. Rather, they were given the freedom to decide how and what to teach within the framework of the standards. The teachers had a strong commitment to the standards but science did not count as schools strived to meet AYP.

Where are the teachers?

According to all stakeholders, the underlying goal of FOCUS was to bring more science into the elementary classroom. That goal was accomplished. However, a parallel goal for FOCUS was to support science learning for classroom teachers. For programs like FOCUS to be sustainable teachers need to be stakeholders in the learning process. Analysis of negotiation revealed that many times FOCUS students took on the role of teacher in the classroom and the teacher became more of an assistant to the FOCUS student or was not even present during the lesson. However, one of the principals mentioned that it would be beneficial if FOCUS could incorporate a co-teaching model in which classroom teachers actually learned science alongside FOCUS students and gained more experience in teaching science.

Respect for Teaching

Another theme that was revealed through the analysis was that FOCUS students had a new-found respect for the teaching profession. The FOCUS students entered into this program with little or no experience in teaching, especially in a formal classroom setting. In light of their

time in the classroom they all felt that they had misjudged the challenges a teacher faces each day and found teaching to be much more difficult then they assumed before participating in FOCUS. Ruth said that, "I thought that being a teacher was really not that difficult of a job. After getting a tiny glimpse of the profession, I have changed my mind a little bit about how hard being a teacher really is." FOCUS students came to understand that teaching did not only include being knowledgeable about presenting the content but also the work that went on before and after school for teachers. Ann explained her thought on being a teacher as, "so really, teaching is almost like a job and a half, because the teacher has the kids all day long, and then has to work on lesson plans and preparations at night or on the weekends in their spare time". This new-found respect for teachers and the teaching profession not only informed these students' existing communities of practice as science students but as future community members.

Teaching in Future Plans

Although none of the student participants in this study decided to go into the teaching profession they felt this experience benefited them personally with their communication skills and experience working with children in general. Angela added the following about her growth in communicating: "so the communication and knowing how to communicate with people on different levels has just been a huge thing […]". They all had some form of commitment to stay involved in their communities in the future and specifically, an interest in staying involved with schools. They all stated that this commitment to their future communities was revealed through their participation in FOCUS. Ann explained, "just like from doing this like I would love to volunteer even if it was just helping with reading but I would love to do something with science." They gained an experience through FOCUS that they intended to translate into their own lives and future career goals. All these students had experiences before high school that

allowed them some connection to the community but at such a large university they felt FOCUS really helped them have this experience with the community during their college career. Ruth said the following about her FOCUS experience: "I haven't really had the opportunity to work with them [kids] in college, so I really get a lot out of working with kids, so it has been fun for me to get to know some kids again and be around them." They believed that because of the FOCUS experience they would be involved in schools at some level in the future. Until they saw the state of science instruction in elementary schools firsthand it never occurred to them that there was a need. Ann put it best as, "I had no idea that science, that science education was something that needed to be a priority in the classrooms, I didn't know that they weren't already getting it, so like as far as that I definitely want to do something like that."

This section concludes with a quote from one of the FOCUS student participants, Ann. She captured what many of past participants say about the program and its affect on their lives. Ann summarized her experience in FOCUS with the following:

> I have to say that Project FOCUS has not only been the highlight of my days at UGA, but it has been the highlight of my college career hands down. I learned a lot about life and how to interact with first graders. As a result of Project FOCUS, I am definitely going to look into volunteering in elementary schools in the future. In conclusion, I just want to say that Project FOCUS has been the highlight of my college experience. I will never forget the experiences that I had in the classroom as a teacher- I have a lot of fond memories as a result of this program. I am so glad I had the opportunity to participate.

Productive and Unintended Outcomes for the Communities of Practice of FOCUS

Research question three asked "what are productive and unintended outcomes associated with stakeholder's negotiation of FOCUS?". The productive and unintended outcomes associated

with negotiating FOCUS were not limited to the ways in which classroom teachers and FOCUS students negotiated in the classroom. The outcomes also included how the Discourses developed through these negotiation scenarios and the Discourses of other stakeholders, outside of the immediate classroom setting, informed the larger community of practice of FOCUS.

Outcomes for the Community of Practice of the FOCUS Students

The Discourse of Trust that came from the elementary schools and thus teachers may have resulted in the productive outcome of FOCUS students becoming part of the community of practice of teachers. All FOCUS student participants in this study, with the exception of Kelly, crossed the boundary encompassing the community of practice of teacher. They became engaged in the community of practice of teachers, as they were typically responsible for most aspects of teaching science while in the classroom. From this experience and crossing boundaries into the community of practice of teachers they began to realize the challenges elementary teachers face in the classroom. Overtime, they were more comfortable with this role and felt that, even though they would not pursue teaching as a career, determined it to be a valuable learning experience.

This could also be considered an unintended outcome as well in that FOCUS students did not, for the most part, enter the program with aspirations of pursuing a career in teaching but through their crossing of boundaries into the community of practice of teachers it seemed to be at the least, a profession they valued more as a result of participation. In Ann's case, she began to view teaching as an alternative path if not accepted to dental school. The FOCUS students were allowed into the community of practice of teachers and thus, this influenced the way they viewed the teaching profession and their future involvement in their communities later in life.

Outcomes for the Community of Practice of Teachers

An unintended, but informative outcome from the negotiation of FOCUS applied to the classroom teachers. The classroom teachers, to varying degrees, did not cross the boundary from classroom teacher to that of science student or teacher. As discussed in the scenarios of negotiation the teachers gave much of the responsibility of planning and teaching science, especially hands-on science, to the FOCUS students. At times, the teachers isolated themselves from the actual teaching of science. This goes back to the teachers' original commitments and Discourses of trust, experience, learning, testing, and miscommunication that were developed through the negotiation of FOCUS. They had commitments to children learning to read and success on high stakes assessments. Ms. Smith, relied on her Discourse of Experience with FOCUS which gave her the ability to trust the FOCUS student and the larger FOCUS program to provide the science experiences she felt she could not offer. Thus, a reliance on FOCUS was formed. The teachers ultimately relied on the FOCUS students to provide the elementary students with hands-on science experiences they felt they could not provide. Ms. Hart developed a Discourse of Trust in FOCUS and even though she did move beyond just being a legitimate peripheral participant in science teaching she still relied on FOCUS to bring hands-on science opportunities to her elementary children. She also helped develop the Discourse of Learning along with her FOCUS student, Angela. This Discourse of Learning was apparent in that both stakeholders moved from thinking about science as fun, to consider what and how elementary students were actually learning. Although Ms. Hart realized that her elementary students were engaged most when science was hands-on she still felt reliant on FOCUS to offer such opportunities. Ms. Vail also played a roll in developing a Discourse of Testing with her FOCUS student, Ruth. Testing became a focal point of their negotiation processes, as Ms. Vail had to

focus on test preparation for the high stakes assessments rather than teach science or allow Ruth to teach science. Ms. Roberts and Kelly developed a Discourse of Miscommunication that resulted from their negotiation of how they each failed to communicate with each other about their needs in FOCUS and their respective roles.

In combination, these Discourses revealed an unintended outcome of FOCUS, where teachers were engaged and negotiated between their own communities of practice and that of the science students, but there were still boundaries that prevented them from changing their own teaching practice, especially in science. The Discourses revealed through the negotiation scenarios suggested that teachers were limited in their ability to cross boundaries from that of elementary teacher to science teacher and learner.

Chapter Seven: Conclusions and Implications

This study focused on how stakeholders negotiated a university-elementary school partnership known as FOCUS. Previous research on the status of elementary science achievement revealed tensions central to facilitating meaningful science for elementary learners. This research was an important introduction into the elementary school setting where FOCUS took place and the theoretical framework this study was built upon. In this chapter, the results are further discussed in the context of what they meant for the different stakeholders who participated in FOCUS. Implications are addressed in terms of university-school partnerships, elementary science teaching, teacher education, and future research. Finally, the methodological implications of this study are discussed.

Conclusions

In this study, communities of practice reflected the ways in which different stakeholders participated in and negotiated the FOCUS experience, the commitments they brought to the experience, and the Discourses revealed through engagement. Communities of practice also provided a context in which stakeholders interacted and negotiated beyond their typical participation in activities associated with the elementary school and university settings. Stakeholders affiliated with elementary schools expressed commitments to children learning to read and performing well on standardized assessments. They valued science, although science was not in the foreground of their commitment. The teachers seemed to rely on FOCUS to provide opportunities for their students to engage in science, especially hands-on science. FOCUS worked well in this context because stakeholders could maintain their existing

commitments while at the same time they could see the benefit the elementary students received from the program. The following sections describe the significance of the results from the perspective of the elementary schools, classroom teachers, and FOCUS students.

The Elementary School and Classroom Teacher Context

It can be argued that science was not part of the elementary schools' or teachers' commitments because other subjects such as language arts and mathematics took priority. Language arts and mathematics were more important not necessarily because the teachers and schools valued them more than science but because they were held accountable for their students' performances on tests in these subject areas. Science was not on the tests, or at least not counted for AYP, so it took a back seat to other subjects. The Discourse of Testing was a very powerful influence on how the teachers and school principals talked about their commitments. Because science was not a part of this discourse, inevitably the time and energy dedicated to it was limited.

The Discourse of Trust became apparent as teachers relied on the FOCUS students to do most of the teaching of science and the principals listened to the teachers' desires to continue the program; trust was placed in both FOCUS and the teachers. The Discourses of Trust from both the community of practice of the schools and the classroom teachers revealed that although they valued science it did not assume a priority. Teachers appreciated the additional help the FOCUS students provided, but they were not willing to offer any more of their time or effort to increase science achievement. The result was that, for the most part, teachers excluded themselves from teaching science when the FOCUS students were present. FOCUS provided a means for students to have opportunities to do hands-on science, and while FOCUS students taught science the teachers could fulfill other commitments to other subjects. Additionally, because science was not

included in AYP teachers felt they could trust the FOCUS students, to different degrees, to bring science to the classroom.

The teachers and principals wanted their students to be excited about learning, but they were also were committed to excelling on the standardized assessments. This is where FOCUS fit into the elementary school context. The elementary schools could offer their students the opportunity to learn a subject they considered fun and that was not part of test preparation. It also gave the teachers a break from their commitment to testing. The program was justifiable because science was not part of the testing culture and could easily fit into the daily schedule as long as teachers did not have to participate in the planning or accessing of resources. The FOCUS teachers all felt that they and their students learned best through doing, especially hands-on activities, but revealed that without the FOCUS students they would typically teach science from the textbook. It may be that these teachers reverted back to how they were taught. It is interesting that the teachers' memories of science in their own education were when they were involved and doing something hands-on, but these experiences were limited. Thus, it could be argued that the teachers, because they mostly taught science from textbooks and lecture formats could not be expected to change their teaching practices to something they did not have much exposure to in their own learning.

If the teachers themselves were not pushed to learn science and it was not a priority in their daily teaching routine, then why should it be a commitment? The teachers experienced something with FOCUS that was valuable in that elementary students were excited when the FOCUS students arrived and seemed to engage in the subject matter. The FOCUS students gave their students an opportunity to have a break from the daily routine established in their respective classrooms and this was enough to satisfy the teachers, their commitments to other subjects and

commitments to student learning. If science was fun maybe they could justify the rest of the school day as being more about test preparation or learning through teacher directed methods. They didn't have many professional development opportunities in science so they may have been missing important opportunities to reflect and engage in practices they assumed were good for student learning; instead they shifted that responsibility to the FOCUS students.

The Discourse of Trust was important in that teachers trusted FOCUS as a vehicle for providing children with science experiences. It may be that such a program in math or reading would not be successful because these subjects are warranted much of instructional time because of testing. The subjects teachers taught seemed to be disconnected, or at least science was disconnected from the rest of the daily schedule. FOCUS students came to teach science and left without really disrupting the flow of the day or what needed to be accomplished. The small amount of time set aside for science and FOCUS was minor compared to the rest of the day and the subjects to be covered. Additionally, teachers invested their time in planning and instruction of other subjects because they relied on having FOCUS students teach science. Time was not lost and they justified it because their students seemed to enjoy the program and the teachers felt the students were learning.

Who was telling the school, the teachers, and the students that science was important? It obviously did not come from the standardized assessments or authorities that dictated what was on the tests each year. This goes back to the notion of community of practice where stakeholders have common goals and ways of making meaning that hold the group together. In the community of practice of FOCUS there were many different commitments but none seemed to really focus on science teaching. The individual commitments together revealed that FOCUS was indeed successful because science was valued at an individual level but never assumed a large position

or goal for the entire community of practice. For programs like FOCUS to be sustainable all stakeholders have to make a commitment to the goal of increasing science learning, not just time for science. It has to come from all levels of the community to be sustainable and afford opportunities for stakeholders to work together to promote and obtain this goal.

FOCUS Student Context

The FOCUS students brought commitments of pursuing careers in science fields, especially areas of the health profession, to the experience. With the exception of Kelly, all the FOCUS students had fairly clear visions of what they wanted to do in the future and their aspirations related to medical professions. As discussed in the analyses chapters a Discourse of the Future was revealed through their commitment to pursuing careers in the medical field. This Discourse was significant because working in elementary classrooms was not part of their future endeavors and removed them in some ways from their daily routine as science students. They all came to the experience wanting to share science with elementary students but through the process they realized that time for science was limited. The subject they valued and wanted to pursue after college was not a priority in elementary schools. They learned about the pressures of testing and all had discontent with how this marginalized science from the daily schedule.

FOCUS students' commitments to science were originally formed from their desires to pursue it as a career, but through working in the elementary classrooms they learned that their expectations for science in elementary classrooms had to be revised. They learned about teaching and the need for more science in the classroom and also life lessons along the way. It is significant that many of the FOCUS students in this study recalled fond memories of science growing up, either inside or outside the classroom and this helped to construct their ideas about liking science and wanting to pursue it as a career. The FOCUS students made comments about

specific teachers that really influenced them throughout their education and suggested that they wanted to share these experiences and what they could offer as science majors to the elementary students. They did, however, have to negotiate with other stakeholders who had commitments outside of science and this is where it seemed that most of the FOCUS students were able to easily fit into the role of science teacher. They were almost handed the task of being the science teacher without any prior teaching experience. Recall that Mr. Pearce said that some of his teachers were very choosy about what university their student teachers came from, but FOCUS was widely accepted among many of his teachers. It could be that because science was not a high priority or commitment for the schools or teachers, FOCUS fit easily into the classroom setting without the teacher or school having to worry too much about what their students actually learned or how achievement could fit with the larger mandated testing culture.

The FOCUS students had many role models that influenced their decision to pursue science and especially health professions. This was part of the reason why they wanted to give back and share their positive experiences with science with elementary students. In thinking about why it was so easy for the schools and teachers to allow FOCUS students into this setting it could be that yes, the teachers may not have had great role models in science and if they did, they wanted to share the same experience with their elementary students. Thus, the FOCUS students were allowed access whereas it might be more difficult to let student teachers whom are not viewed as "science people" in the door so easily. The elementary teachers did not view FOCUS as an opportunity to teach the university students other than providing them with an open door to their classroom and allowing them to have an opportunity to sometimes learn for themselves what teaching and the teaching profession was like. Most of the FOCUS students had minimal teaching experience before they started FOCUS. Hence, they may have not viewed

FOCUS as an opportunity to learn to become a teacher but rather as a way of exploring their community outside of the university setting or to do something different. In most cases, they did not view FOCUS as essential in determining their career path.

Coming Back to Why Stakeholders Chose to Participate in FOCUS

Reasons behind stakeholders' choice to participate in FOCUS revealed Discourses associated with commitments connected to their existing communities of practice. The elementary schools participated because they valued science and had constructed a Discourse of Trust for FOCUS through listening to classroom teachers about their needs for FOCUS to continue. Although the elementary schools were committed to children learning to read and succeeding on standardized assessments they listened to their teachers request for the program, which seemed sufficient to justify the continuation of the program. The classroom teachers participated in FOCUS because they valued science but, many times, felt they did not have the time or resources to teach hands-on science in the way FOCUS students did. In understanding teachers' reasons for participating in FOCUS it became apparent that they also formulated Discourses related to Testing, Time, and Trust. Again, the teachers valued science but because of time constraints placed on science instruction, resource limitations, and focus on their students excelling on standardized assessments, that did not include science, they relied on FOCUS to fill this void for science. The elementary teachers believed their students enjoyed science and FOCUS was a way for teachers to fulfill this need. These findings are significant because the teachers could rely on and trust FOCUS to offer their elementary students an enjoyable experience with science, while at the same time fulfilling their commitments to teaching. FOCUS did not really take much time for the classroom teachers and thus, it was an easy and reliable source of science for their students that required little personal commitment.

University students participated in FOCUS for the following two reasons: (a) they wanted to share their interest in science with young children, and (b) they wanted to have an experience in the larger community outside of the university setting. In addition to these reasons a Discourse of the Future was revealed through how the university students talked about their commitments in the community of practice of science students. The FOCUS students in this study had ambitions of pursuing careers in the medical field (Kelly maybe the exception but after participating in FOCUS still had ambitions of going into a science field). Although they were interested in having an experience in the community outside the university, teaching was not viewed as a potential career option. Because the FOCUS students did not have existing commitments to teaching the decision to participate may have been easy. This experience did not require them to alter their commitments to science or their Discourse of the Future. The elementary schools and teachers had commitments outside of science and the FOCUS students had commitments to their future careers. The ease with which boundaries were crossed between the communities of practice of the schools, teachers, and university students may not have been because all stakeholders had commitments to science education but commitments in other places.

It seemed that the FOCUS students and classroom teachers were coming from very different communities of practice and this influenced the way in which they reflected on their experience and their desire to participate in the program. FOCUS was presented to the university students as an opportunity to help elementary teachers with science instruction. They may not have come into the program thinking that they would take on the role of science teacher. Instead, perhaps they envisioned that they would compliment the already existing teaching of science in the elementary classrooms. However, they faced the reality that if they were not there science might only come from the textbook, if at all. They came to realize that science was not a priority

of the community of practice of the elementary schools they worked in. The FOCUS students not only learned that their passion for science and wanting to share it with elementary students would be utilized but, to varying degrees, realized that without their help science would look very different or not happen at all. Thus, the FOCUS students had nothing to lose. They were idealized as science experts and came to the school without any or few preconceived notions of the priority of science. This may be very different from student teachers who have completed many years of education courses that are intended to introduce them to the complexities of teaching. The FOCUS students entered the program with a perspective on what could be done in the classroom without really knowing much about teaching or the priority of science in elementary schools. Only after time, did they come to realize the complexities of teaching and how science instruction did not always fit into the norms of classroom teaching practices. This may be why the FOCUS students did express their heightened appreciation for the teaching profession. Even though none of the FOCUS student participants decided to pursue a career in teaching they did respect the profession because of the experience.

Implications

The productive and unintended outcomes associated with negotiating FOCUS were discussed in terms of communities of practice. The intent of this section is to discuss the productive and unintended outcomes in terms of what they meant for the communities of practice involved in FOCUS, as well as implications for other communities. To begin, it was important to acknowledge that stakeholders from different communities of practice were brought together through science education. Goodlad and Sirotnik (1992) argued that the sustainability of university-school collaborations relies on stakeholders' acknowledgment of differences that exist in university and school operations. They emphasized that "the differences must be appreciated

by the partners even when they produce abrasions, as they undoubtedly will" (p. 207). In the context of FOCUS, the above quote is relevant because although stakeholders brought different perspectives to the partnership all were important in understanding how the program operated as it did. The intent here is not to argue for a change in how each of these institutions currently operate but to consider how FOCUS, and programs that seek to model FOCUS, can move forward and sustain a positive learning experience for all stakeholders involved.

Implications for University-School Collaborations

Although FOCUS appeared to be sustainable in the elementary schools it currently serves, findings from this study can illuminate improvements that could be made to the program. All stakeholders who participated in this study viewed FOCUS as a positive contribution to the larger community, specifically the elementary schools within which it operated. As mentioned in the literature review, recent STEM initiatives provide funds to support programs modeled after FOCUS. Findings from this study can assist in implementation of such programs. In light of standardized testing constraints it is important to note that for programs such as FOCUS to be successful and sustainable, universities have to recognize the importance that elementary teachers and schools place on standardized assessments. It was revealed through this study that although the elementary schools and teachers who participated in the program valued science and valued FOCUS, they still placed importance on achievement in standardized assessments. At the time this study was conducted science was not among the subjects reported for AYP. This was significant because as was revealed through this study the elementary teachers and school principals all spoke to their commitment to do well on the standardized assessments. If science were to be included in the AYP report it could be that the elementary teachers and school principals would consider science as more of a priority. The impact that would have on FOCUS

can not be determined to date but it can be suggested that the way FOCUS operates now may need to be revised.

FOCUS seemed to work because although schools and teachers valued science, they did not make it a priority in their daily schedules. Recall that Ms. Vail had Ruth do test practice for the state assessment several weeks before the test instead of science and Ms. Hart voiced her discontent with the emphasis placed on standardized assessments. Programs that intend to model FOCUS need to realize that science, although valued, may not be a priority in the schools they work with and flexibility may be necessary when working with schools and classroom teachers to ensure a successful partnership. The intent of such programs should not be to force science upon elementary schools and teachers but open opportunities for more science to be incorporated into the schools' daily schedules.

Another important implication for university-school collaborations centers on the notion of communication. As revealed in the study not all partnerships between teachers and university students are optimal. Three of the four teacher and university student pairs in this study had a good working relationship. However, Ms. Roberts and Kelly struggled with communicating their needs to each other and, in turn, may have missed some of the experiences FOCUS intended for its participants to have. Although not every program can be perfect it is the hope that those who participate have positive experiences. For institutions that seek to start a similar program it needs to be understood that the intent of the program and communication with all stakeholders is vital to the success and longevity of the program. Recall that Kelly was considering teaching prior to enrolling in FOCUS and this was a motivation for her to participate in the program. What if Kelly had had a positive experience working with Ms. Roberts? Would she pursue a career in teaching instead of medicine or another science field? It seemed for Kelly that her academic

pursuits may have been a factor in deciding not to pursue teaching after her experience in FOCUS.

Implications for Elementary Science Teaching

This study revealed that although classroom teachers valued science and the science opportunities the FOCUS students provided for their children they failed to become full participants or at least move further towards the community of practice of science teachers. The teachers, to varying degrees, were engaged in teaching while FOCUS students were in the classroom, yet all teachers seemed to rely on FOCUS students to provide hands-on science. What does this mean for elementary science teaching and learning? It means that for elementary teachers to gain access to full participation within the context of the community of practice of FOCUS and similar programs, they have to transform their commitments to science education for not only their students but for themselves as well. It is worth exploring why these teachers handed over their classrooms to inexperienced teachers, that is, the FOCUS students. The teachers in this study stated they did not have time to teach science, so they placed at least some of the responsibility on the FOCUS students.

For teachers to have a larger role in the teaching that occurs during FOCUS time they have to feel that time can be given to science and their participation valued and accepted by school administration. Teachers have to be given adequate support and time by their respective schools and school administration to teach science in the way they seem to value but not actually implement. The intent of programs such as FOCUS needs to not only be about helping elementary learners gain access to science knowledge but teachers as well. If elementary teachers are to be involved in learning science as well as teaching it, time has to be made available during the school day so that they can engage in practices that not only assist their students in

constructing knowledge, but them as well. The administration at the schools did not control the educational policies that dictate what was or was not included on the standardized assessments or required to meet AYP. They could though, as school leaders, create the time and space for teachers to explore their own learning and the type of instructional strategies that enhance student achievement. It was observed by the researcher and suggested by the school principals and classroom teachers that science and social studies were to split a fifty-minute period. Upon searching for who stipulates the time for science at the elementary schools in which FOCUS operates neither the state education website or the county website offered any information about the time for science or how time should be allocated among the subjects.

For FOCUS to be sustainable in this climate of testing it could be useful for stakeholders to find ways to integrate science into other subject areas. Scholars have pointed to the need to integrate the science curriculum with subjects such as language arts and mathematics that count for AYP at the elementary school level (Lee & Luykx, 2005; Marx & Harris, 2006). In terms of FOCUS, science teaching and learning would not be restricted to a designated time block. This would hopefully allow the elementary schools and classroom teachers to be able to provide more opportunities for science learning for their students while at the same time meeting needs and requirements in other subject areas.

Implications for Teacher Education

The researcher of this study suggested that the elementary teachers were not involved in the shared practice of teaching science with the FOCUS students. According to Benton and Schillo (2004), voluntary involvement and reflective self-improvement by teachers are key components of successful university-K-12 partnerships. For FOCUS to be sustainable and elementary schools to assist their teachers in becoming better science educators there exists a

need for this program to consider how it can move forward and become a site for professional development. The teachers already had limited opportunities for professional development in science and seemed to place emphasis on other subjects. It could be argued that if the ultimate goal of education and more specifically science education lies in student achievement teachers to be included as learners as well. As Beerer and Bodzin (2004) noted, "the ultimate goal of professional development is to get results - improved student achievement" (p. 47). What if there were incentives for teachers to participate more in the actual teaching of science throughout the FOCUS experience? There has to be motivation from the elementary teachers to not only view FOCUS as a way to help elementary students receive more science, especially hands-on science experiences, but as a way for them to be involved in the teaching and learning process as well.

A recommendation stemming from this study is that how FOCUS is initially presented to teachers should be revised. Instead of a program that offers science assistance to elementary teachers, FOCUS should become a program where the intent is for all stakeholders to form a commitment to not only fostering the achievement of elementary students but also facilitating the learning of elementary teachers and university faculty. FOCUS could be revised so that the teachers and undergraduate students could attend workshops that allowed them to explore inquiry-based ways of instruction. The FOCUS students in this study did attend an orientation and reflection sessions each week but these were separate from working directly with the teachers. Thus, a question that arises is whether FOCUS worked in the existing context because teachers were not mandated to be full participants in the program? They were really not held accountable in the eyes of the program because the university students had no background in education and thus maybe not as much was expected of them, unlike pre-service teachers who practicing teachers know come through an education program. Ms. Hart pointed out that she

knew that FOCUS students were not education majors so although she did not have the expectation that they would actually be able to teach she was cognizant of the fact that they did know science.

Researchers (Benton & Schillo, 2004; Blackwell, 2004; Van Metre, 2000) have argued that for partnerships to be successful there need to be opportunities for pre-teaching experience for the undergraduates who participate in such programs. Additionally, there needs to be opportunities to build on the teaching capacity of the existing classroom teachers. Did FOCUS create the perfect storm where there was an underlying, tangible benefit for teachers to participate that underscored their potential to learn through the process? Maybe they didn't really feel they could learn that much from the FOCUS students or that as long as FOCUS was around they did not have to worry about science. As discussed in the literature review, elementary teachers typically have limited opportunities to continue their own education in science, especially in terms of professional development. FOCUS might have appeared to be a way for elementary teachers to increase their science knowledge but through this study it became apparent that the learning may have been limited to the elementary students. Because of time, testing, and resources the teachers felt they could not participate as learners or in many cases, as educators, during FOCUS. It seemed that the teachers used FOCUS as a way for their students to learn science but did not include themselves in the learning process as well.

A recommendation for the future plans of FOCUS would be to have the classroom teachers receive professional development credits for participating in FOCUS. The type of professional development proposed here would not be limited to the classroom teachers but include the FOCUS students as well. A professional development model involving a combination of pre-experience workshop and action research projects that involve both the

elementary teachers and FOCUS students might be considered as a viable alternative. This different way of presenting FOCUS to the classroom teachers and university students may help facilitate a closer working relationship between them and create opportunities for learning. This model would hopefully encourage the classroom teachers to take a more active role in the community of practice of FOCUS. As previously mentioned, the FOCUS students attended an orientation before they began their work in the classroom. This orientation could be modified into a workshop format where the FOCUS students and classroom teachers participate collaboratively. The workshop would not only demonstrate to FOCUS students ways of doing hands-on science with elementary learners but teachers would be involved in helping them become acquainted with teaching strategies and the needs of their particular class. Saul (2002) conceptualizes a workshop, specifically a science workshop, as including three components: authenticity, autonomy, and community. These three elements would be important to consider when developing the FOCUS workshop as well. Authenticity means that science workshops need to "foster the kind of thinking engaged in by scientists" (p. 5). Autonomy emphasizes the need for teachers to enable their children to learn on their own and seek their own answers. Community represents how classrooms should be places where both the students and teachers work together to learn. "Children and teachers seek to help one another grow, learn, and share the frustration and delight of working hard" (p. 8). Saul (2002) uses these tenets to argue that for workshops, especially science workshops, to be successful in elementary school contexts there exists a "need to begin with the strengths teachers have and with their ability to locate help when necessary" (p. 10).

Saul (2002) suggests that teacher education, especially in science, needs to offer the same experience as what is advocated for students; time to engage and reflect on what has been

learned. Thus, this workshop could ideally be over a two-day period, so that the teachers and FOCUS students would have time to develop rapport with each other, synthesize information and lessons learned from day one, and apply it to day two of their work together. As learned in this study, teachers already feel many constraints placed on time; thus initially, a workshop format might be limited to one day at one of the partner elementary schools. In addition, Loucks-Horsley et al. (1998) recommend that professional development needs to be long term. Thus, an action research project, developed between the FOCUS student and classroom teacher, would allow them to not only continue to implement and modify lessons they plan together for the elementary students but also construct a project that allows them to consider issues and topics relevant to the particular classroom environment. The action research project would obviously take time to plan and implement but Loucks-Horsley et al. (1998) argued that for professional development to be affective "teachers need to be both agents and objects of their own professional growth" (p. 260). That stated, an action research project would allow the teacher and FOCUS student pairs to develop their own research questions. According to Loucks-Horsley et al. (2003) action research projects not only promote ownership over the process but help the participants develop commitments to make changes to their teaching practices based on the findings. Through this semester-long project the teacher, alongside the FOCUS student, could examine their practices in tandem, which would hopefully increase the success of FOCUS in the individual classroom and create a more meaningful dialogue between the pair.

to implement this type of professional development model there are certain requirements and resources that would need to be put in place. According to Loucks-Horsley et al. (2003), to implement action research as a model for professional development the stakeholders involved need access to research resources, time, administrative support and an atmosphere conducive to

experimentation, and opportunities to share the results of their research. Obviously, time has been a major constraint on teachers in FOCUS. If Magnolia State faculty in science education or elementary education assisted the elementary teachers and FOCUS students in becoming familiar with how to conduct action research and acted as consultants to them, it could be a meaningful and rewarding way for them to learn more about their own practices within the classroom and where future modifications could be made. It would also be helpful if FOCUS students and teachers received an introduction to action research at the pre-service workshop. An introduction might be led by a faculty in education familiar with action research who could provide insight into how this form of inquiry could be conducted in the classroom environment.

In an ideal setting, the classroom teachers and FOCUS students would have time to conduct an action research project, attend a pre-service workshop, and participate in co-teaching together. Rainer and Matthews (2002) suggested that truly beneficial teacher development occurs where there are many opportunities for speaking and hearing each other. Benton and Schillo (2004) argued that teachers need time to reflect on their personal practice using meaningful tasks to help them understand how teaching habits influence student achievement. Loucks-Horsley et al. (2003) suggested that lesson studies be used as a means to promote teacher collaboration and learning in science. Lesson studies are built around the idea that teachers work together to develop lessons by discussing, teaching, observing, and revising specific lessons to enhance student learning (Loucks-Horsley et al., 2003). Lesson studies could be one way to involve the FOCUS teachers in all stages of planning and teaching science in collaboration with the FOCUS students. Another suggestion comes from Tobin and Roth's (2005) notion of cogenerative dialogue. They suggest that cogenerative dialogue can be used as a way to improve learning for all stakeholders in the school environment. Cogenerative dialogue is built around the idea that

teachers, students, and at times, administration and university supervisors are engaged in conversations about specific lessons (Tobin & Roth, 2005). "The power of cogenerative dialoguing lies in the fact that all participants refer to the same set of events, […] and that the views and understandings of all participants are valued. Thus, understandings and explanations are cogenerated" (Tobin & Roth, 2005, p. 315). In FOCUS, cogenerative dialogue could be a way to not only involve the teachers and FOCUS students but also the elementary students and school administration in meaningful conversations about science teaching and learning.

Although these professional development tools outlined above may be a way to get the classroom teachers more involved in the actual teaching of science where would the time come for them to be reflective and not only collaborate with the FOCUS students but fellow teachers? Obviously, time was very restricted for the classroom teachers and they could not take time out of their day to plan just science with the FOCUS students. For FOCUS to have a role in helping teachers have the time and space to reflect on their own teaching practices, specifically science teaching, there has to be incentive to participate beyond the existing model, where teachers rely on FOCUS students to teach science, especially via hands-on activities. The main reason teachers signed up for FOCUS was to get help with science. The teachers never commented on how they viewed this as an opportunity to learn science from the university students. Thus, by creating a way, through professional development, for the teachers and FOCUS students to have more time to interact and consider what teaching and learning opportunities should be afforded to elementary students the outcome would hopefully lead to more value being placed on the experience for the classroom teacher and FOCUS student.

Although here it has been suggested that FOCUS and similar university-school collaborations may want to consider ways in which to incorporate professional development

opportunities for teachers, measurements of student achievement after participating in the program would be beneficial. It could be argued that, "in the case of current teachers, the challenge becomes relating the learning from a particular type of partnership to an improvement in teaching and student success" (Callahan and Martin, 2007, p. 143). What if FOCUS brought elementary education majors into the program? Would this help them develop a deeper understanding of science or at the least give them more opportunities to explore science teaching before they stepped into the classroom? The literature suggests that many elementary teachers are not prepared to teach science and tend to have low self-efficacy around science teaching (Fulp, 2002). Also, VanMetre (2000) argued that, for reform to happen in the classroom, more value needs to be placed on collaborations between practicing teachers and pre-service teachers in ways that create opportunities for knowledge to be shared in both directions. If elementary pre-service teachers were involved in FOCUS this modified design could be effective in helping these education majors acquire a deeper understanding of science and give them opportunities to teach science to the elementary students they will be teaching in future years. This cooperative approach could be a way to increase future elementary teachers' knowledge, understanding, and abilities to teach science.

If FOCUS wants to move forward and include the teachers as members of the community of practice and involve them more in the decision making processes of lesson development, teaching mentoring, etc., there may have to exist an underlying interest in increasing their science content knowledge. It may be that FOCUS students would also benefit greatly from the mentorship of the teachers. As with the case of Kelly and Ms. Roberts it seemed that neither moved from the community of practice of teacher and science student but rather stagnated in their own positions. Blackwell (2004) suggested for university-school partnerships to be

successful they must foster good communication between all parties. It seemed that for this pair, the lines of communication were not always open or clear and resulted in the individuals not benefiting from the experience as much as they maybe could have. If FOCUS had been presented in terms of a mentoring opportunity for FOCUS students but through which the elementary teachers would also get help with science and be involved in constructing lessons, Ms. Roberts and Kelly may have had clearer expectations for each other upon entering the program.

Implications for Future Research

As mentioned in the introduction, the elementary students were important stakeholders in FOCUS but were not included in this study. Future research could examine the impact FOCUS has on student achievement at the partner schools. In light of high stakes assessments and the push for learning how to increase student achievement, especially in science, it would be important to examine the impact FOCUS has not only on elementary student achievement but also if and how it has helped to change students' ideas and motivations to learn science. It would be especially interesting to conduct a longitudinal study to see if elementary students who participated in FOCUS considered careers or at the least degrees in science. This would obviously take a considerable amount of time and effort to trace students from elementary school through college and beyond but would be an important area of research to consider.

As stated, some of the FOCUS students do decide to either change their college major to education, pursue advanced degrees in education, or pursue other alternative routes to the classroom. It would be an important piece of research to track students who decide to pursue education and see if they do indeed take up careers in teaching. It would also be informative to gain data on where previous FOCUS students are teaching and how many years they have remained in the field. A long-standing concern in the field of education is attrition rates. It would

be interesting to know whether students who participate in FOCUS remain in the teaching field for an extended number of years. A similar line of research could be conducted on teacher recruitment. It would be insightful to not only track FOCUS students who decide to pursue careers in education but determine if FOCUS actually was the main motivating factor. This research could be important in not only understanding science students' motivations to enter the teaching field but also teacher recruitment.

If FOCUS were to be revised upon the recommendation given above in terms of providing more opportunities for the classroom teachers and pre-service teachers to be a larger part of the community of practice, it would be interesting to study the impact of FOCUS on teachers and pre-service teachers' beliefs surrounding science and science teaching. This research would hopefully offer insight into how programs that intend to increase science experiences for elementary children may also impact pre-service and practicing teachers. If these results were linked to higher student achievement in science an argument could be made for more universities and schools to invest in collaborations such as FOCUS.

Methodological Implications

In this section the methodological implications of this study will be briefly outlined. To begin, the ways in which stakeholders negotiated FOCUS were only examined over one semester. Looking back, especially for the case of Ms. Smith and Ann it would have been valuable to gain insight into not only how they reflected on the experience of working together for four semesters but to actually be witness to this experience as a researcher. The same could be applied to Ms. Hart and Angela who had worked together for an entire year. It may be that too much time had passed. Their relationship had developed over the entire year they worked together. Thus, instead of being able to capture how Ms. Hart and Angela negotiated during the

study, they could only provide reflections on how they had done things in the beginning of their work together. Thus, some of their experiences and how they described them were based on reflections instead of actual engagement in those practices during the study. Through data collection it became apparent that teachers and FOCUS students seldom had informal face-to-face conversations. This limited the researcher's ability to identify ways in which they negotiated, especially in planning for science. The researcher was reminded though that most of their planning was via e-mail and all participants were diligent about sending e-mails to the researcher when they conversed back and forth with each other. Finally, the conceptions of communities of practice, commitments, and Discourses were definitely developed throughout the course of the study. Even though the concepts and how they would be used in this study were understood by the researcher, their connection to each other was less clear upon entering the writing phase of this project. With that said, if in future studies the researcher uses the same or similar constructs the intent should be to collect and analyze data in a way that brings cohesion to these terms and allows her to reveal meaningful implications for educational research.

References

American Association for the Advancement of Science. (1993). *Benchmarks for science literacy*. New York: Oxford University Press.

Baldi, S., Jin, Y., Skemer, M., Green, P. J., & Herget, D. (2007). *Highlights From PISA 2006: Performance of U.S. 15-Year-Old Students in Science and Mathematics Literacy in an International Context* (NCES 2008–016). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington DC.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Barth, R. S. (1990). *Improving schools from within*. San Francisco: Jossey-Bass Publishers.

Barth, R.S. (2001). *Learning from the heart*. San Francisco: Jossey-Bass Publishers.

Beerer, K., & Bodzin, A. M. (2004). How to develop inquiring minds. *Journal of Staff Development, 25*, 43-47.

Benton, C. J., & Schillo, J. M. (2004). School and university collaboration partners: A model for collegial support of literacy and professional development. *Action in Teacher Education, 24*(4), 30-37.

Blackwell, P. J. (2004). Putting the system together: Lessons learned by the Eisenhower initial teacher professional development programs. *Action in Teacher Education, 25*(4), 38-47.

Board of Regents of the University System of Georgia (2008) *USG presidents' Science, Technology, Engineering, and Mathematics (STEM) initiative.* Retrieved January 11, 2009 from http://www.usg.edu/p16/initiatives/PDFs/stemsummary.pdf

Bracey, G.W. (2007). U.S. performance in international comparisons: An overview. *Principal Leadership (Middle Sch Ed), 7,* 66-69.

Bryan, L.A. (2003). Nestedness of beliefs: Examining a prospective elementary teacher's belief system about science teaching and learning. *Journal of Research in Science Teaching, 40*, 835-868.

Bybee, R. W. (2007). Science teaching and international assessments. *The Science Teacher, 74,* 41-48.

Bybee, R., & Stage, E. (2005). No country left behind. *Issues in Science and Technology, Winter,* 69–75.

Callahan, J.L., & Martin, D. (2007). The spectrum of school–university partnerships: A typology of organizational learning systems. *Teaching and Teacher Education, 23,* 136–145.

Cannon, K. C., & Sandler, S. R. (2000). A successful model for an academic-industrial partnership for elementary science education. *Journal of Chemical Education, 77,* 1291-1294.

Clark, R.W. (1992). School-university relationships: An interpretive review. In K.A. Sirotnik & J.I. Goodlad (Eds.) *School-university partnerships in action: Concepts, cases, and concerns*. (pp. 32-65). New York and London: Teachers College Press.

Cobb, P., McClain, K., Lamberg, T., & Dean, C. (2003). Situating teachers' instructional practices in the institutional setting of the school and district. *Educational Researcher, 32,* 13-24.

Coble, C. R., & Azordegan, J. M. (2004). The challenges and opportunities of the No Child Left Behind Act: Seven strategies for teacher education. *Action in Teacher Education, 26*, 2-14.

Cochran-Smith, M., & Lytle, S. L. (1999). The teacher research movement: A decade later. *American Educational Researcher, 28*(7), 15–25.

Committee for Research on the Education of Students Placed at Risk. (1996). *Urban student mobility disrupts education and reform efforts. CRESPAR research and development Report*. Retrieved January 10, 2009, from http://scov.csos.jhu.edu/crespar/urbmobil.html

Council on Competitiveness (December, 2004) *Innovate America*.

Czerniak, C., & Lumpe, A.T. (1996). Relationship between teacher beliefs and science education reform. *Journal of Science Teacher Education, 7,* 247–266.

Czerniak, C. M., & Schriver, M. (1994). An examination of preservice science teachers' beliefs and behaviors as related to self-efficacy. *Journal of Science Teacher Education, 5*(3), 77-86.

Darling-Hammond, L. (1998). Teacher learning that supports student learning. *Educational Leadership, 55*(5), 6–11.

Diamond, J. B., & Spillane, J. P. (2004). High stakes accountability in urban elementary schools: Challenging or reproducing inequality? *Teachers College Record, 106*, 1145–1176.

Eick, C. J., & Reed, C. J. (2002). What makes an inquiry-oriented science teacher? The influence of learning histories on student teacher role identity and practice. *Science Education, 86*(3), 401-416.

Ediger, M. (2001). Assessing: Inquiry learning in science. (ERIC Document Reproduction Service No. ED454274).

Enochs, L. G., Scharmann, L. C., & Riggs, I. M. (1995). The relationship of pupil control to preservice elementary science teacher self-efficacy and outcome expectancy. *Science Education, 79*, 63-75.

Farley, M. (1986). *Personal commitments*. San Francisco, CA: Harper & Row.

Fulp, S. L. (2002). *2000 National survey of science and mathematics education: Status of elementary science teaching*. Chapel Hill, NC: Horizon Research. Retrieved January 12, 2009, from http://2000survey.horizon-research.com/reports/elem_science/elem_science.pdf

Gee, J. P. (1999). *An introduction to discourse analysis: Theory and method*. New York: Routledge.

Giddens, A., Duneier, M., & Appelbaum, R. (2007). *Introduction to sociol*ogy (6th ed.). New York: W.W. Norton & Company, Inc.

Goodlad, J.I., & Sitotnik, K.A. (1992). The future of school-university partnerships. In K.A. Sirotnik & J.I. Goodlad (Eds.) *School-university partnerships in action: Concepts, cases, and concerns*. (pp. 205-225). New York and London: Teachers College Press.

Goldston, D. (2005). Elementary science: Left behind? *Journal of Science Teacher Education, 16,* 185–187.

Gonzales, P., Williams, T., Jocelyn, L., Roey, S., Kastberg, D., & Brenwald, S. (2008). *Highlights from TIMSS 2007: Mathematics and science achievement of U.S. fourth- and eighth-grade students in an international context*. National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. Retrieved January 11, 2009, from http://nces.ed.gov/pubs2009/2009001.pdf

Governor's Office of Student Achievement (2007). *K-12 public schools*. Retrieved on February 10, 2009 from http://gaosa.org/FindASchool.aspx?TabRequested=District&FromSection=report&PageReq=106&CountyId=629&SY=2008

Hatcher, J.A., & Bringle, R.G. (1997). Reflection: Bridging the gap between service and learning. *College Teaching, 45* (4), 153-158.

Hofstede, G. (1997). *Cultures and organizations: Software of the mind*. New York: McGraw Hill.

Hughes, J., Jewson, N., & Unwin, L. (2007). Communities of practice: a contested concept in flux. In J. Hughes, N. Jewson, & L. Unwin (Eds.) *Communities of practice: Critical perspectives* (pp. 1-16). London and New York: Routledge.

King, K., Shumow, L., & Lietz, S. (2001). Science education in an urban elementary school: case studies of teacher beliefs and classroom practices. *Science Education, 85*, 89-110.

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

Lee, O., & Luykx, A. (2005). Dilemmas in scaling up innovations in science instruction with nonmainstream elementary students. *American Educational Research Journal, 42*(5), 411–438.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Lowell, B. L. & Salzman, H. (2007). *Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand*. Washington D.C.: Urban Institute.

Loucks-Horsley, S., Hewson, P.W., Love, N, & Stiles, K.E. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

Loucks-Horsley, S., Love, N., Stiles, K.E., Mundry, S., & Hewson, P.W. (2003*). Designing professional development for teachers of science and mathematics* (2nd Ed.). Thousand Oaks, CA: Corwin Press.

McLaren, P. (1998). *Life in schools: An introduction to critical pedagogy in the foundations of education* (3rd Ed.). New York, NY: Longman.

Marx, R.W. & Harris, C. J. (2006). No child left behind and science education: Opportunities, challenges, and risks. *The Elementary School Journal, 106*, 467-477.

Mathison, S. (1988). Why triangulate? *Educational Researcher, 17*(2), 13-17.

Mulholland, J. & Wallace, J. (2001). Teacher induction and elementary science teaching enhancing self-efficacy. *Teaching and Teacher Education, 17*, 243-261.

National Institute of Child Health and Human Development–Early Child Care Research Network. (2005). A day in third grade: A large-scale study of classroom quality and teacher and student behavior. *Elementary School Journal, 105*, 305–323.

National Research Council. (1996). *National science education standards*. Washington, D. C.: National Academy Press.

National Research Council. (2000). *Inquiry and the national science education standards.* Washington, D.C.: National Academy Press.

National Science Teacher Association (2003). *Standards for Science Teacher Preparation.* Retrieved January 11, 2009, from http://www.nsta.org/pdfs/NSTAstandards2003.pdf

National Science Teachers Association (2008). *NSTA issues statement regarding the results of the 2007 trends in international mathematics and science study.* Retrieved January 12, 2009, from http://www.nsta.org/about/pressroom.aspx?id=55488&lid=exp

No Child Left Behind Act of 2001, Pub. L. No. 107-110,115 Stat. 1425.

Office of Continuous Improvement and Information Support Services. (2007). *A comparison of AYP status for the Clarke County School District and its schools.* Retrieved January 12, 2009, from http://www.clarke.k12.ga.us/files/268/Two%2DYear%20AYP%20Comparison%20of%20AYP%20%2D%20July%202007.pdf

Plourde, L.A. (2002). The influence of student teaching on pre-service elementary teachers' science self-efficacy and outcome expectancy beliefs. *Journal of Instructional Psychology, 29*, 245-253.

Pultorak, E., McCarthy, J., & Young, M.W. (2006). School and university partnerships and the role of teacher as researcher. *Action in Teacher Education, 28,* 99-109.

Rainer, J.D., & Matthews, M.W. (2002). Ownership of learning in teacher education. *Action in Teacher Education, 24*(1), 22-30.

Ramey-Gassert, L.,Walberg, H. J., & Walberg, H. J., III (1994). Reexamining connections: museums as science learning environments. *Science Education, 78*, 345-363.

Ramey-Gassert, L, Shroyer, M. G., & Staver, J. R. (1996). A qualitative study of factors influencing science teaching self-efficacy of elementary level teachers. *Science Education, 80,* 283-315.

Rigden, J. S. (1999). Training K-6 teachers to teach science. *The Education Digest, 64*, 59-61.

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teachers' science teaching efficacy belief instrument. *Science Education, 74*, 625-637.

Ross, D. L., & Mason, C. L. (2001). *University science majors in collaborative partnerships with elementary teachers: Inquiry based teaching and learning.* Proceedings of the Annual Meeting of the Association for the Education of Teachers in Science. (ERIC Document Reproduction Service No. ED 472 913).

STEM Education Before High School: Shaping Our Future Science, Technology, Engineering and Math Leaders of Tomorrow By Inspiring Our Children Today before the Committee on Science and Technology, U.S. House of Representatives, 110th Cong., (2008).

Saklofske, D. H., Michayluk, J. O., & Randhawa, B. S. (1988). Teachers' efficacy and teaching behaviours. *Psychological Reports, 63*, 407-414.

Saul, W. (2002). *Science workshop: Reading, writing, and thinking like a scientist* (2nd Ed.). Portsmouth, NH: Heinemann.

Scott, A.K., Oliver, J.S., & Knauft, D.A. (2005). Service-learning and science: A success story. *Academic Exchange Quarterly, 9*. 222-228.

Scott, A.K., Oliver, J.S., & Knauft, D.A. (2007). Examining the impact of service-learning on college science students' self-report of their learning styles, *NACTA Journal, 55*, 2-9.

Sergiovanni, T. J. (1994). *Building community in schools*. San Francisco: Joseey-Bass Publishers.

Sivertsen, M. L., R. W. Riley, S. P. Robinson, & Conaty, C. (1993). *State of the art: Transforming ideas for teaching and learning science: A guide for elementary science education.* Washington, DC: U.S. Department of Education. Retrieved January 20, 2009, from http://eric.ed.gov:80/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/29/a8/c8.pdf

Smith, L.K. & Southerland, S.A. (2007). Reforming practice or modifying reforms?: Elementary teachers' response to the tools of reform. *Journal of Research in Science Teaching, 44,* 396–423.

Smith, M.H., & Trexler, C.J. (2006). A university-school partnership model: Providing stakeholders with benefits to enhance science literacy. *Action in Teach Education, 27*, 23-34.

Spillane, J.P., Diamond, J.B., Walker, L. J., Halverson, R., & Jita, L. (2001). Urban School Leadership for Elementary Science Instruction: Identifying and Activating Resources in an Undervalued School Subject. *Journal of Research in Science Teaching, 38*, 918-940.

Sterling, D.R., Matkins, J.J., Frazier, W.M., & Logerwell, M.G. (2007). Science camp as a transformative experience for students, parents, and teachers in the urban setting. *School Science and Mathematics, 107,* 134-148.

Storey, J. (1998). *An introduction to cultural theory and popular culture* (2nd Ed). Athens, GA: The University of Georgia Press.

Sunderman, G. L., Orfield, G., & Kim, J.S. (2006). The principals denied by NCLB are central to visionary school reform. *The Education Digest, 72*(2), 19-24.

Teitel, L. (1999). Looking toward the future by understanding the past: The historical context of professional development schools. *Peabody Journal of Education, 74*, 6–20.

Tobin, K., & Roth, W.-M. (2005). Implementing coteaching and cogenerative dialoguing in urban science education. *School Science and Mathematics, 105*, 313-322.

Tönnies, F. (1957). *Gemeinschaft und gesellschaft* [Community and Society] (C. P. Loomis, Ed. & Trans.). New York: HarperCollins. (Originally published 1887).

U.S. Department of Education. (2007). *Report of the Academic Competitiveness Council,* Washington, D.C.

U.S. Department of Education (2008). *Letter from Kerri L. Briggs, Assistant Secretary for the Office of Elementary and Secondary Education to Kathy Cox, the State Superintendent of Schools for Georgia.* Retrieved January 12, 2009 from http://www.ed.gov/admins/lead/account/cornerstones/ga.pdf

Van Metre, S. (2000). Productive partnerships. *Delta Kappa Gamma Bulletin, 6*(1), 38-40.

Weiss, I.R., Banilower, E.R., McMahon, K.C., & Smith, P.S. (2001). *Report of the 2000 National Survey of Science and Mathematics Education.* Chapel Hill, NC: Horizon Research, Inc.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. New York: Cambridge University Press.

Wenger, E., McDermott, R.A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston, MA: Harvard Business School Press.

Williams, R. (1983). *Culture and society, 1780-1950*. New York: Columbia University Press.

Willower, D., Eidell, T., & Hoy, W. (1973). *The school and pupil control ideology (revised)*. University Park, PA: Pennsylvania State University Studies.

Yerrick, R., Parke, H., & Nugent, J. (1997). Struggling to promote deeply rooted change: The ‘‘filtering effect’’ of teachers’ beliefs on understanding transformational views of teaching science. *Science Education, 81,* 137–159.

Appendix A: Individual Interview Questions

Interview # 1 for classroom teachers

1. What do you remember about science in school (elementary through college)?
2. Do you think science is important for your students? In what ways? What do you hope your students will get out of science instruction?
3. How did you decide to become an elementary teacher? What are your goals for your students?
4. How would you describe science instruction in your classroom? Why do you approach science instruction in this way? What would be your ideal vision for science teaching? What would you need to achieve this ideal? What do you think works against this ideal?
5. Why did you sign up for Project FOCUS?
6. What do you understand the goals of Project FOCUS to be?
7. What do you hope to get out of your partnership with Project FOCUS? What do you think your students will get out of Project FOCUS? What do you think the FOCUS student will get out of his/her partnership with you and your class?
8. What advice would you give your FOCUS student to help him/her be successful at teaching science in your class?
9. If you were asked to describe the state of science instruction in elementary school to the general public (or to policymakers), what would you want them to know?

Interview # 2 for classroom teachers

1. What are your impressions of Project FOCUS so far?
2. What do you think your students think about Project FOCUS?
3. Do you think Project FOCUS meets your needs/goals for science instruction? In what ways?
4. Is there anything in particular you would change about your FOCUS student's approach to science? Why would you make this change?
5. What are your goals for Project FOCUS now? Have they changed?
6. Describe a positive experience you have had with the Project FOCUS student while they are teaching.
7. Describe a negative experience you have had with the Project FOCUS student while they are teaching.

Interview # 3 for classroom teachers

1. What have been the meaningful experiences to you in Project FOCUS?
2. How has your view of science instruction changed as a result of participating in Project FOCUS?
3. What type of science opportunities would be present in your classroom if a FOCUS student was not there? Do you still teach science on the days the FOCUS student is not in your classroom?

4. What decisions, as far as what science was being presented to the students, do you feel you were in charge of? What do you feel the FOCUS student was in charge of?
5. What changes, if any, have you seen in your FOCUS student's approach to teaching science or just teaching in general?
6. Thinking back to the beginning of the semester do you feel your role during science time while the FOCUS student is in your classroom has changed? If so, in what ways?
7. What have you learned about science and science teaching from your FOCUS student?
8. What do you feel the FOCUS student has learned from you?
9. Is there anything in particular you would change about your FOCUS student's approach to science? Why would you make this change?
10. What are your goals for Project FOCUS now? Have they changed?
11. Describe a positive experience you have had with the Project FOCUS student while they are teaching.
12. Do you have any feedback you would give your FOCUS student to help them with their teaching? Would you change anything?

Interview # 1 for FOCUS students

1. When did you realize you liked science? When did you know that you wanted to pursue science?
2. What experiences have you had with science in school?
3. How did you decide to pursue science as a college major and future career? What do you like (or find rewarding) about being a science major? Is there anything you find frustrating about being a science major?
4. What, if any, is your experience in teaching? Please describe.
5. What do you think it will be like to teach science to elementary students? What do you think will be the biggest challenges? What do you think will be the biggest rewards? What do you think is important for elementary students to know (or understand) about science? Why are these things important for elementary students?
6. Have you ever considered being an elementary teacher? Would you consider being a teacher? Why or why not?
7. What do you think are some issues that elementary teachers face? What is significant about these issues? What do you think it would be like to be an elementary teacher?
8. Why did you sign up for Project FOCUS?
9. What do you understand that goals of Project FOCUS to be?

Interview # 2 for FOCUS students

1. How do you feel about your experience in the classroom? What has surprised you most about working with elementary students? What has been most rewarding? What has been most challenging?
2. How, if any has your own ideas about teaching changed since you began the program?
3. Describe an event when you were teaching where you feel students were learning.
4. Describe an event when you were teaching where you feel students were not learning. What could have you done differently?
5. What are your goals for Project FOCUS now? Have they changed?
6. Describe a positive experience you have had with the classroom teacher while you were teaching.

7. Describe a negative experience you have had with the classroom teacher while you were teaching.

Interview # 3 for FOCUS students

1. What do you think has been valuable about your participation in Project FOCUS?
2. When you started Project FOCUS what did you hope to accomplish? What do you think you accomplished by participating in Project FOCUS? What do you think your students got out of your participation in FOCUS? What do you think your cooperating teacher got out of your participation in FOCUS?
3. What would you have done differently if you could start the semester over?
4. Do you think your view of science has changed as a result of participating in FOCUS? If so, how?
5. What issues did find challenging/rewarding about working with elementary students? Working in an elementary school?
6. If you were asked to describe the state of science instruction in elementary school to the general public (or to policymakers), what would you want them to know?
7. Where, if at all, does science teaching fit into your future goals?

Appendix B: Group interview questions

Interview # 1 for pairs (classroom teachers and FOCUS students)

1. Can you describe a FOCUS session? When you planned this session what did you want students to get out of it? What do you think they got out of it?
2. How do you (teacher or FOCUS student) decide what to teach during FOCUS sessions?
3. Please describe how you plan for a science lesson together.
4. How do you view the others role in the classroom?
5. Describe an activity or event where you both felt confident students were learning and excited about science?
6. Describe an activity or event where you both were not confident students were learning and excited about science?
7. As you plan for future FOCUS sessions what issues would you want to see addressed? (what haven't you covered that you'd like to cover?—not just content, but other aspects of science)

Interview # 2 for pairs (classroom teachers and FOCUS students)

1. What have you learned from each other through this experience?
2. What would you change about Project FOCUS if you could? Why?
3. If you could create five goals for Project FOCUS to meet what would they be and why?
4. How has this experience affected the way you view teaching, specifically science teaching?
5. Please describe how you typically plan for a science lesson. How, if any, have your planning strategies changed over the course of the semester?
6. How do you view the others role in the classroom and has this changed over the course of the semester?
7. What have been some of your most memorable moments while working together?
8. Describe an activity that you did in the last few weeks where you both felt confident that students were learning and excited about science.
9. Describe an activity that you did in the last few weeks where you both felt confident that students were not learning and excited about science.
10. How do you feel about the time that has to be split between science and social studies?

Appendix C: Example Journal Prompts

Examples of Journal Prompts: FOCUS students will be asked to write about for the course and as a data source. Students are required for the course to write about a one-page double-spaced journal entry (10 in total for the semester).

Your First Journal Entry
FOCUS Spring 2008

These responses should be conversational in tone and should provide evidence of reflective thought. Each answer should be explained thoroughly and supported by anecdotes and examples. These responses typically span 3-4 pages.

1. Do you believe teaching is a difficult profession? Explain your answer.
2. What qualities make a good teacher? Explain your answer.
3. Think of student you have encountered in past classes who you didn't consider to be successful academically. Why do you believe this was the case?
4. Do you plan on pursuing a career in teaching? Why or why not?
5. How do you know when you have really learned material? Provide an example.
6. What do you believe should be the goals of science instruction? How do you think a teacher should go about reaching those goals?

Additional Journal Prompts

1. What do you remember most about the science instruction you had in elementary school? Is this the same instruction you would like to mimic in your FOCUS teaching practice?

2. What are you most surprised about in your teaching experience so far this semester?

3. Do you consider teaching a profession? Please explain.

4. What has been the most rewarding part of the FOCUS experience thus far?

5. What were your original expectations for the semester? Have these expectations changed? How and why?

Summary Reflection for Spring 2008
Guiding Questions

These are usually between 5 and 6 double-spaced pages.

1. Describe the moment you learned the most about teaching during this experience. You can refer to time in the classroom, conversations with your teacher or peers, journaling, or the reflection sessions—anything involved with this course. If you don't feel you learned about teaching, explain why.
2. Describe the moment you learned the most about learning during this experience. Again, draw from any part of this experience. If you don't feel you learned about learning, explain why.
3. Describe a moment in this experience when you felt you learned something significant about yourself. If you feel you didn't learn anything about yourself, explain why.
4. Has this been a valuable experience for you? Why or why not?
5. Has participation in this program influenced your work in your own studies? Why or why not?
6. Briefly comment on your partner teacher. Would you recommend placing another student in their classroom?

Appendix D: Interview Questions for principals and program developer

Interview questions for principals

1. Why did you decide to have Project FOCUS at your school?
2. What do you understand the goals of Project FOCUS to be?
3. Do you think science is important for your students? In what ways? What do you hope your students will get out of science instruction?
4. What has your school, students, and teachers gotten out of your partnership with Project FOCUS?
5. What advice would you give your FOCUS student to help him/her be successful at teaching science in your school?
6. If you were asked to describe the state of science instruction in elementary school to the general public (or to policymakers), what would you want them to know?

Interview questions for program developer

1. Please explain how Project FOCUS was started and who was involved?
2. What was your initial vision for Project FOCUS?
3. How has the vision changed over the past five years?
4. What are some of the most important things you believe FOCUS students get out of the program and why?
5. What are some of most important things you believe FOCUS teachers and the elementary students get out of the program and why?
6. What additional goals do you have for the future of Project FOCUS?
7. Do you think Project FOCUS meets the needs/goals for science instruction in elementary schools in our area? In what ways?
8. If you were asked to describe the state of science education in elementary school to the general public or policy makers what would you want them to know?
9. What have been some of your most memorable experiences with FOCUS and why?
10. What have been negative experiences and why?

Figure 1. Data collection timeline

Data Collection Timeline (2008)	Individual Interviews with students	Individual Interviews with teachers	Group Interviews	Interview with principals	Interview with program developer	Classroom Observations	Researcher's Journal	FOCUS student journal entries
January 8-11	X					X	X	X
14-18		X				X	X	X
21-25			X			X	X	X
February 4-8						X	X	X
11-15						X	X	X
18-22						X	X	X
25-29						X	X	X
March 3-7	X					X	X	X
10-14		X		X		X	X	X
17-21						X	X	X
24-28						X	X	X
April 1-4					X	X	X	X
7-11						X	X	X
14-18						X	X	X
21-25	X					X	X	X
April 28-**May** 2		X				X	X	X
May 5-9			X			X	X	X