Master Teachers' Experiences and Perceptions of Educational Reforms: Case Studies of Three Rural Science Teachers

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ABSTRACT

In the current era of school reforms, teachers are being asked to make decisions regarding instruction and school improvement that they were not hired to perform, nor prepared to perform (Elmore, 2002). The discrepancies between teacher motivation to become teachers and the requirements for success are causing many teachers to leave the profession.

Qualitative case study research was conducted to discover the experiences and perceptions of three master science teachers with regard to the changes that have occurred over the course of their careers and the adoption of the Common Core State Standards and the Next Generation Science Standards. Through the case study analysis and the resulting cross-case analysis, the themes of the rural effect on science education, the administrative effect, the effect of standards and assessments, and the effects of school improvement on science teachers were identified and explored.

Findings of the research indicate that rural teachers will often remain in a position because of their family and community ties to a location regardless of their current working environment. Teacher satisfaction is determined by their ability to help students succeed in life, and not on standardized tests. Finally, the administration's ability to mediate school reform and understand the school culture is imperative for school improvement to occur.

The implementation of the Common Core State Standards and the Next Generation Science Standards has the potential to change the face of education in the United States, but the potential may be unfulfilled if teachers are not empowered to implement the standards with fidelity.

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ACKNOWLEDGEMENTS

> [12] Not that I have already obtained all this, or have already arrived at my goal, but I press on to take hold of that for which Christ Jesus took hold of me. [13] Brothers and sisters, I do not consider myself yet to have taken hold of it. But one thing I do: Forgetting what is behind and straining toward what is ahead, [14] I press on toward the goal to win the prize for which God has called me heavenward in Christ Jesus. Phillipians 3: 12-14

I would like to thank my family for all of the support that they have given me throughout this process. Without the support of my wife, Joanna, I would not have been able to complete this process. I would like to thank my children, Zach and Christopher, for being excellent children and understanding the many times that I would have to work. Hopefully, I will be a much better father and husband with the completion of this project and this degree.

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DEDICATION

This body of work is dedicated to:
My wife and children who supported me throughout the completion of this project.

Chapter I

INTRODUCTON

I am a science teacher, but I have crossed over into the realm of school improvement and reform as a science academic coach at a rural South Georgia school. I have taught high school science for twelve years, working for six different principals, each with distinctly different leadership styles. One principal at the larger high school would stay in his office, and the staff would quiver if they were called to see the principal. This principal had a stern hand on the affairs of the school, and no decisions were made without his approval. At another high school, the principal would greet the teachers in a cordial manner, and the staff could freely discuss school-wide topics with him. The principal would not make staff mandates regarding instruction, discipline, or supervision unless he had the consent of the staff. If mandates were made from *on high*, the principal would explain the situation to the staff, and the staff would work together to deal with the new situation and outside pressure.

In my years of experience, I have sensed the feelings of joy when a school would make great strides because of the collaborative effort of the staff. I felt disappointment and discouragement when *outsiders* came in to improve school test scores without the input or consent of the staff. I felt powerless and discouraged because my ability to have a *voice* in the matters of the school functions was stripped away by those who *knew* better.

Numerous science teachers made an enduring impression on my practices and teaching techniques. These teachers epitomized my ideas of the effective science teacher. Their resiliency and endurance to teach for years despite the stress, long hours, little pay, and little appreciation have made me curious about their experiences as science teachers.

I have a passion for teaching students about scientific concepts and skills. The satisfaction I gain as a teacher in southern Georgia is deepened when I hear stories about how science has become central to the careers of my former students who have gone on to become physical therapists, entomologists, botanists, pharmacists, nurses, or doctors. I can see the long-term impact of science education and the contributions that these former students will make in the communities and lives of others. Aside from careers, the life lessons my students have taken with them into adulthood provide the greatest career satisfaction. The "thank-you" letters sent to me from my former students reaffirm my decision to become a science teacher because I can see the positive effect that I have had in my students' lives. The lowest points in my career have resulted from the inner conflict I have experienced when I have reviewed some of my students' scores on standardized tests. Standardized test scores that define students' understanding can be frustrating, particularly when I know that my students understand the material beyond what is on an exam. I find it difficult to judge my performance as a science teacher when my values as a teacher are not in line with the values of a predetermined curriculum or when the reduction of academic content is translated to a standards check-off sheet.

Like other teachers across the nation, in southern Georgia, I have endured numerous changes and school reform efforts during the years that I have been teaching. The rise of the standardized End-of-Course-Tests (EOCT) in Biology and Physical

Science dramatically changed the emphasis of my courses from inquiry-based learning activities to more testing related activities. As a vital part of my education in science, I learned about the processes and strategies of inquiry based learning and teaching methods that allowed students to learn scientific concepts through constructivist approaches. Because of my preparation for certification and training, I believed that students would learn about science through the processes of *doing* science. However, the implementation of high stakes testing practices and various school reform efforts has made me evaluate many of my teaching practices and strategies.

I can remember vividly the frustration that I felt when I was told of the numerous curriculum and testing changes that would be implemented soon after my first year of teaching because of the implementation of high-stakes EOCT tests. When I attended a faculty meeting prior to the start of the school year, we were told our school would move towards the implementation of the Georgia Performance Standards (GPS) from the Quality Core Curriculum (QCC). The message was clear that if I wanted to be a successful teacher, I had to begin teaching with the high-stakes test in mind, rather than prioritizing and investing in development of the academic content and the processes of science. The necessity to cover the required curriculum to achieve higher test scores left me feeling forced to change to accommodate a greater emphasis on test-taking strategies instead of inquiry, scientific processes, curiosity, and a true *love* of learning about science.

I can even now palpably feel the tension and stress arising from the prospect of implementing yet another set of current mandated reform conditions through the Next Generation Science Standards (NGSS) and the Common Core State Standards (CCSS) as

they unfold in the state of Georgia. The tension and pressure I experienced when I was accountable for implementing the mandates of education reform in my science classroom, and the discrepancies between what I knew my students understood yet was not represented by their standardized test scores lead me to ask: What is the impact of educational reform mandates on the teaching experiences of science teachers?

School reform and subsequent changes in how schools are governed and systematically managed have been discussed since the beginning of public education, and school reforms have been initiated to improve many societal and educational problems (Elmore, 2007; Hess & Finn Jr., 2007; Tyack & Cuban, 1996). School systems have implemented many programs in order to standardize instruction and improve school test scores (Hess & Finn Jr., 2007). In response to the call for accountability, many school systems have adopted highly touted school reform programs to dramatically improve student achievement on standardized tests. For example, in the state of Georgia, America's Choice became the *go to* model for school reform (Tucker & Codding, 1998). The America's Choice school reform model eventually became the model of reform that guided the development of the GPS. Another highly touted reform model was the Learning Focused Schools (LFS) model, which included a set of rehearsed strategies to increase student learning through a standardized pattern of instruction. Supposedly, if teachers implemented specific LFS strategies and procedures, then student achievement would increase across the board. To ensure the implementation of LFS strategies, teachers were evaluated by an administrator, who would enter the classroom unannounced with a Blackberry to document whether or not a teacher was using the prescribed strategies.

When I consider my experiences as a science teacher, I must take into account the experiences of the generation of experienced science teachers who have taught since *A Nation at Risk* (ANAR) in 1983. These senior teachers were my mentors and colleagues in my professional development as a teacher. I agree with Tyack and Cuban (1996) who suggest that the experiences of master teachers should be considered when school reform efforts are attempted because ultimately teachers are responsible for the success or failure of the efforts.

Teachers who believe that they are appreciated and that their opinions matter find work more satisfying and stay in the profession of education longer than teachers who do not (Goodlad, 2004). According to Goodlad (2004), "Studies showing that supportive conditions such as supportive leadership by the principal, availability of help, and involvement in school wide decisions, tend to be associated with greater enthusiasm, professionalism, and career fulfillment on the part of teachers" (p. 176). Goodlad (2004) effectively describes many of the conditions that influence teacher satisfaction. In an era when teachers are ultimately held responsible for student achievement on standardized tests, teachers pay the price for their students' inability to succeed when practices they are mandated to implement are inadequate to meet the needs of all of their students. If teachers are included in the processes of reform, rather than being the subject of reform, then they will have greater career fulfillment, which increases the potential for longevity and greater career satisfaction (Ingersoll, 2003b; Sarason, 1996; Whitaker, Whitaker, & Lumpa, 2009).

In the book, *Teachers at Work*, Susan Moore Johnson portrayed the experiences and motivations of many of the teachers in the United States. According to Susan Moore

Johnson (1990), "If teachers are to succeed in meeting the many social and academic needs of their students, they must work in schools that make teaching not just possible, but likely" (p. 28). According to Johnson's research, teachers in five school districts had to contend with physical, organizational, sociological, economic, political, cultural, and psychological characteristics of their schools before they could even begin to consider teaching subject matter. Therefore, the findings suggest that teachers must develop a culture of learning and achievement before they may successfully teach content matter. In many schools, however, the obstacles to success may be too great for a teacher to overcome during a semester or course, and the teacher is *predestined* to fail in the world of standardized-testing. If the work environment hinders or undermines the efforts of teachers, then teacher satisfaction and performance decrease (Ingersoll, 2003b; Sarason, 1996; Whitaker et al., 2009).

"Research on occupational choice and values has shown that an unusually large proportion of those entering teaching are motivated by what is called an altruistic or public-service ethic" (Ingersoll, 2003b, p. 168). According to Jupp (2011), the findings of a national survey conducted by the National Education Association (NEA) in 2005 indicate that teachers enter the field because they are motivated by (a) a desire to work with young people, (b) the significance of education in society, and (c) an interest in the subject matter (Jupp, 2011, p. 157). On the other hand, teachers remain in their profession because they have "too much invested" to leave the field of education (Jupp, 2011, p. 157).

According to Susan Moore Johnson (2011), "The generation of teachers retiring or nearing retirement today is the first to have made teaching a lifelong career" (p. 143).

The teachers who are retiring have experienced numerous changes regarding curriculum and the implementation of standards, and standards-based testing has greatly changed the landscape of American education (Ravitch, 2010). The experiences and perceptions of teachers should be considered with regard to school reform if schools are going to improve (Elmore, 2007; Goodlad, 2004; Sarason, 1996; Whitaker et al., 2009). If experienced teachers need to be included in the larger conversations to shape the policies of educational reform, and it is vital that teaching is a sustainable career trajectory, then we must include their *voices* in the examination of the impact of reform on their work.

Purpose of Study

The intent of this research is to provide insights and lessons learned from science teachers who have experienced the impact of educational reform on their teaching and the quality of their professional careers. *Critical pedagogy* is primarily concerned with the opinions of individuals or groups who have been *oppressed* by a dominant group (McLaren, 1989). Traditionally, critical pedagogy validates and documents a perspective that is inclusive of the diversity of student needs rather than a system based on views of the dominant white, middle-class notion of education. Smith and McLaren (2010) identify critical pedagogy as a means to give oppressed groups a *voice* when they normally would not have one. The inability of teachers to control their working environment and their personal situation within their chosen profession leads to the notion that teachers are an *oppressed* group who are rarely provided an opportunity to express their opinions regarding school reforms and policies (Ingersoll, 2003b; McLaren, 1989; Sarason, 1996; Smith & McLaren, 2010).

The primary purpose of this study is to identify the experiences and perceptions that rural science teachers have had with the various school reform models since the publication of *A Nation at Risk* and to identify the manner in which rural science teachers mediated the various school reform efforts. In the current era of school reform, it is vital to *give voice* to the generation of science teachers who have either just left the profession, or who will be leaving soon. The *voices* of these experienced science teachers may influence school reform policies and improve the experiences and conditions of the next generation of science teachers.

Research Questions

1. What have been the experiences and perceptions of master science teachers with school reform and improvement in rural Georgia?
2. How can the experiences and perceptions of master science teachers in rural Georgia guide school reform and improvement in the future?

Methodology

Case study research should be used to understand a real-life phenomenon in depth (Yin, 2009). To discover the answers to these questions, I conducted case studies using multiple methods to study the experiences and perceptions of science teachers with regard to science education in rural Georgia. In her book, *The Good High School,* Sara Lawrence–Lightfoot (1983) eloquently described the conditions and cultures at six high schools found in either urban, suburban, or elite school settings. From Lawrence-Lightfoot's descriptions and imagery, the reader is able gain insights into the qualities and practices of the leadership, culture, and experiences of individuals found in her study.

Lawrence-Lightfoot (1983) was guided by a desire to illustrate and describe goodness in schools.

In the book, *I've Known Rivers: Lives of Loss and Liberation,* Lawrence-Lightfoot's (1994) authenticates the lived realities of conflict and triumph in the lives of six black individuals who overcame much diversity through the use of words and imagery. Lawrence-Lightfoot's (1994) deft use of imagery is the inspiration for the study of rural science teachers and their experiences with school reform. According to Lawrence-Lightfoot (1983), "It seemed easy for us to recite all of the problems teachers and students confront and create in secondary schools – the truancy and dropout rates, the vandalism, the alcohol and drug addiction, the illiteracy of graduates, the teacher burnout, the undisciplined curriculum, the rigid tracking, the racial warfare, on and on – but it seemed difficult, even awkward to find the goodness and talk about the successes" (p. 10). In an era when teachers are consistently told of their failures, we must search for goodness and hear the stories of the individual teachers who succeeded in a difficult career.

When news reports consistently document the failures of schools to meet Adequate Yearly Progress, it is liberating to consider the individuals and their successes in science instruction. Phenomenological research methods are applicable to almost any type of social or human science (Giorgi, 2012). Phenomenology is the proposed primary method of inquiry for my study of science teachers' experiences since *A Nation at Risk*. According to Giorgi (2012), "Phenomenology does not dictate to phenomena but rather it wants to understand how phenomena present themselves to consciousness and the elucidation of this process is a descriptive task" (p. 3).

In a study conducted by Mensah (2009), she provided another model of portraiture through her study of black teachers in science classrooms. The methods by Mensah's study will provide guidance for conducting the study of science teacher experiences since *A Nation at Risk*. Mensah (2009) utilized narrative research procedures and interviews to allow the research subjects to tell their stories. One important concept gleaned from the Mensah's article is the concept of the research subject's playing an integral role in the development of the study and the results. Research subjects will be included throughout the process to tell their stories regarding the school reform policies and mandates over the course of their careers.

In a study conducted by Giles (2007), he identified the relationship between teachers and students in his phenomenological study of the relationships between teachers and students. He described the ability of the phenomenological researcher to identify with the research participants, and the steps that were necessary to conduct his study of the relationships between students and teachers. One important concept garnered from Giles (2007) is that students' perceptions are different from the outcomes that are intended by the teachers. This concept applies to this research because it can help identify the differences between intended educational reforms and teacher perceptions.

Definitions

Master Teachers – Master teachers have taught for at least 20 years and have been recognized by their peers for excellence in the classroom by numerous awards and achievements.

Rural School – Rural schools are central to the community, and many community residents depend on the school for their identity and a sense of pride (Barter, 2008). Rural schools may be large or small, but they are often the only educational option for nearby residents.

School Reforms – school reform is defined by a need to improve the education of individual students so that the students may be successful. Tyack and Cuban (1996) identified the changing definition of school reform as policies that are implemented to improve the educational system for *all* students.

Summary

My experiences in education served as the primary justification for conducting case studies of master teachers. As a teacher, I have undergone numerous changes and reforms, and it is imperative that the experiences of the teachers who have taught since the publication of *A Nation at Risk* are discovered to guide the implementation of the CCSS and the NGSS and any future reforms.

The case studies of Amy, Lauren, and Elizabeth in Chapters 4, 5, and 6 and the cross-case analysis in Chapter 7 provide three master teachers with the opportunity to have a *voice* in the upcoming school reforms through their experiences and their recommendations for future practice.

Chapter II

LITERATURE REVIEW

In his book, *Who Controls Teachers Work? Power and Accountability in America's Schools,* Richard Ingersoll (2003b) describes many of the challenges that teachers face with regard to school reform and the concept of teacher power and control. Ingersoll made several points regarding the concept of teacher control and power (2003b). First, teacher control is important for real school reforms to occur. Second, accountability-based reforms are sometimes unfair to teachers. Third, too much organizational control may deny teachers the autonomy and flexibility to make necessary changes or may decrease the motivation of teachers to do their jobs. Finally, decreased autonomy and control may contribute to the increased turnover of teachers. Ingersoll's discussion of *power* in schools and the amount of control that teachers currently have over their working environment led to the discovery of critical pedagogy as the justification for this study.

Theoretical Framework

According to Smith and McLaren (2010), "Critical pedagogy is an approach to understanding and engaging the political and economic realities of everyday life" (p. 332). In his analysis of schools, McLaren (1989) defines *voice* as the means by which an *oppressed* group or individual is provided with a means to be heard by the *dominant* group. Much of McLaren's work focuses on the *voices* of students with regard to the confines of an educational system, but in the current age of school reform, teachers also

need their *voices* to be heard by school reformers, administrators, and policy makers if true school reform is to be possible. Since the development of public education, policy-makers have wanted reform (Tyack & Cuban, 1996). Many school-reform practices have been cyclic in nature, and teachers have consistently weathered the reform efforts over their careers (Elmore, 2007; Ingersoll, 2003b; Ravitch, 2010). Since *A Nation at Risk* was published, public school teachers have undergone scrutiny for their performance in the classroom, and the following sections will define the numerous reform efforts science teachers have endured and the changing climate of education (Young, 2012). According to Young (2012), "In our education system, good people are doing good things every day. But the system is not always kind to people, leaving them feeling powerless" (p. 163). However, the inability to have a voice in the reform process has led to "frustration, decreased productivity, loss of liberty and freedom, and in some cases, failure" (Young, 2012, p. 165).

History of Reform – The Last Thirty Years

"Reforming the public schools has long been a favorite way of improving not just education, but society" (Tyack & Cuban, 1996, p. 1). Schools have been an important part of the fabric of American culture since the beginning of the twentieth century, and in the minds of many people the American public school system should become better (Ravitch, 2001; Tyack & Cuban, 1996). Since the 1980s, states have reformed education, and the federal government has become involved in the conversation (Anyon, 2005; Elmore, 2007).

The University of Arkansas has identified three major eras of school reform since 1980. These eras are the Era of Crisis, the Era of Standards, and finally the Era of Accountability.

> Critics pointed to low scores on national and international tests; to the widespread practice of social promotion and grade inflation; to the large numbers of teachers who had received degrees in pedagogy, but not in the academic subjects they were teaching; to the high rate of remediation in college; and to the low academic expectations that had become ingrained many American schools. School districts in different parts of the country were rocked by disputes about the curriculum, standards of achievement, and classroom methods. Bitter debates broke out about how to teach reading and mathematics, how much emphasis to place on multiculturism in history and literature, how to measure students' performance, and whether to hold students accountable for their work in school and teachers accountable for their pupils' progress. (Ravitch, 2010, p. 14)

To understand the numerous changes and reform efforts that the American educational system has undertaken since *A Nation at Risk,* we must consider the context of the school-reform movement, and the effects that school reforms have had on teachers (Szal, 2010). Public education has been charged with the responsibility of curing many social, political, and economic problems (Tyack & Cuban, 1996). However, teachers are usually the first group to be blamed when schools are unsuccessful.

The Era of Crisis

In 1983, *A Nation at Risk* was published, and the current era of school reform began. The Congressional report made multiple assertions regarding schools and school quality that began a series of events for educational practices and policies. The report identified many inadequacies regarding the areas of content, expectations, time, and teaching. According to the National Commission on Excellence in Education, the secondary curriculum was described as "homogenized, diluted, and diffused to the point that it no longer has a central purpose" (1984, p. 61). *A Nation at Risk* identified

numerous deficiencies regarding science education and instruction. The report found that the most academically able students are not attracted to the field of education, many teachers were drawn from the bottom quarter of graduating students, and a critical shortage of science teachers existed in most states. Numerous efforts were made to improve teacher quality that culminated in the Highly Qualified Teacher provision of the *No Child Left Behind Act* of 2001 (NCLB) (Eppley, 2009).

As a result of *A Nation at Risk*, the standards movement began to ensure that American workers could compete in a global economy (Ravitch, 2001). School reformers wanted to develop a baseline of knowledge for all American students to compete with the Soviet Union initially (Ravitch, 2001). *A Nation at Risk* called for a public school system that offered a rich curriculum similar to the curricula that is offered in the most successful school systems, and the report made recommendations that could either be acted upon or ignored by the states (Ravitch, 2010). According to Anyon (2005), many of the school reform models included curricular, administrative, and funding reforms to increase student achievement.

The state of Georgia responded to *A Nation at Risk* with the *Quality Basic Education Act* (QBEA) of 1985 (Mizell, 1999). In theory, if schools are provided with appropriate funding for programs, then schools should achieve similar results. The QBEA functioned to increase the number of programs offered to students by providing incentives for rural school systems to provide more programs for the students. One provision for schools to obtain funding from the QBEA was the use of a new curriculum for all schools. The development of the QCC introduced the state of Georgia's first foray into the realm of academic standards and a standardized curriculum for all students.

According to Mizell (1999), "Providing a higher quality of education was reported as the impetus for the development of the Quality Core Curriculum" (p. 124).

The Era of Standards

The 1990s has been referred to as the *Era of Standards* by the University of Arkansas because of the focus on developing educational standards for all students to meet. *A Nation Accountable: Twenty-five Years after A Nation at Risk*, described many of the changes that have occurred since the release of *A Nation at Risk.* According to *A Nation Accountable*, many states began to implement standards-based education systems in the 1980s and early 1990s, but the standards were not very effective. Congress passed the *Improving America's Schools Act of 1994* under President Bill Clinton, which led to the development of content standards and tests and the *Goals 2000: Educate America Act,* which provided funding to develop statewide content standards. In essence, schools have been attempting to reform since the publication of *A Nation at Risk*. The major goal of educational reform was to have all students meet minimum standards of proficiency to graduate from high school (Tucker & Codding, 1998).

According to Tucker and Codding (1998), effective standards should include a) performance descriptions, b) samples of student work, and c) commentaries on student work. In essence, effective standards should guide teachers' instruction towards a specific performance task. If standards are not implemented across all levels of a school system, then the standards will fail to make a significant difference for student achievement (Carr & Harris, 2001).

In 1995, the Georgia Department of Education began reporting the results of standardized testing to the general public in the form of "The Georgia Public Education

Report Card" (Weller & Weller, 1998, p. 159). For the first time, the performance of Georgia schools was published for the general population. Because of the first district wide report card on education achievement, many stakeholders began making comparisons between school districts and the ability of the school districts to educate their students. The newfound emphasis on standardized test scores resulted in increased emphasis of tested subjects (Au, 2007).

Weller and Weller (1998) identified a conflict between beliefs about the validity of standardized testing and performance assessment of student learning. The void between standardized testing and teacher perception of effective instructional practices creates a conflict that many teachers are continually forced to mediate. The statewide passing rate on the Georgia High School Graduation Test for the first year was between 67 and 73 percent for the state of Georgia according to Weller and Weller (1998). Because of the newfound importance of standardized testing, many schools began to implement professional development programs that focused on the improvement of standardized testing scores. Another interesting point brought to light by Weller and Weller (1998) is the increased focus on reading instruction and test-taking skills and practices that would work to improve student achievement on standardized testing.

During the Era of Standards, the National Science Education Standards were released by the National Academy of the Sciences to improve science education and instruction at the end of 1995. The standards were the first attempt to improve science instruction for all teachers and correspondingly their students. The National Science Education Standards identified standards for teaching, professional development, assessment, content, and curricular programs. According to the National Academy of

Sciences, the standards should be assessed through performance based assessments, and ongoing formative assessments to determine student learning (2001b).

Six years later, the National Academy of Sciences published *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning.* This publication placed the emphasis of science education on the process of inquiry for learning process skills and content (2001a). One assertion made by *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning* was that many students learn science content and methods through didactic teaching methods and not inquiry-based methods. According to the National Academy of the Sciences (2001b), students should be assessed utilizing multiple methods of assessment to determine true learning of scientific concepts and procedures, and not solely on student performance on standardized tests.

The call for standards led to many attempts from states to develop effective standards and properly aligned assessments (Spillane, 2004). Numerous criteria must be met for standards to be effective. Tucker and Codding (1998) identified several criteria for academic standards to be effective: standards must a) require students to know core content, b) link book knowledge to real-world applications, c) have teacher support, d) be competitive, and e) be universal. If standards and the corresponding assessments are not aligned, then the standards will not be implemented with fidelity and will ultimately fail (Carr & Harris, 2001).

According to Valencia (2010), the standards movement and the associated tests drive educational reform practices. Jacobs (2010) identifies the reality of standards and assessments on classroom practices. According to Jacobs (2010), "The intention may to

be to help schools reach for targets, but the reality is that often educators feel that teaching to the test is what counts, and the tests are often suspect in terms of value" (p. 10). According to Jacobs (2010), our standards for education should reflect the educational needs of our students for the next generation. However, the need for cost-effective evaluation systems has resulted flawed and ineffective systems that do not adequately evaluate student performance (Engel, 2009).

The Era of Accountability

In 2001, the Era of Accountability was kicked off with the passing NCLB (Harrison-Jones, 2007; Ravitch, 2010). The primary goals of NCLB were to improve the proficiency of all students in the United States regardless of race, economic ability, or intellectual ability, especially in the areas of mathematics and reading. According to Valencia (2010), the necessity for high-stakes tests became the keystone of the standards-based movement. As a result of NCLB, students would be tested at the conclusion of each grade from the third grade to the eighth grade, and once during high school to determine whether or not students had made AYP in the subjects of mathematics and reading (Harrison-Jones, 2007). According to Harrison-Jones (2007), if schools failed to meet AYP for 2 consecutive years, then the school would be under sanctions, ranging from outside consultants to school restructuring, and to vouchers to attend other schools. Unfortunately, the geography and culture of rural south Georgia almost eliminate the option of charter schools and school choice as a viable option for school improvement and reform. Therefore, schools are placed under even greater pressure to reform.

Rural schools must compete with school districts that have more resources to achieve AYP on standardized tests, regardless of the starting point for many of the

students. The provisions of NCLB called for students to be tested regularly in reading and mathematics until the eighth grade and once during high school to determine if students were progressing through their educations adequately (Hess & Finn Jr., 2007). According to Ravitch (2010), the era of accountability changed the emphasis of education away from a well-rounded curriculum to a curriculum in which students can effectively bubble in standardized test answers.

If used correctly, standardized-testing can to identify individual weaknesses and areas of need for student learning (Ravitch, 2010). However, NCLB led to an emphasis on mathematics and reading education for all students, and the other subjects were often neglected (Au, 2007). One result of the emphasis on these two subjects for meeting AYP was the shift in focus towards the tested subjects and away from subjects like science, history, and the arts (Au, 2007; Ravitch, 2010).

According to Hess and Finn Jr. (2007), the remedies for failing to meet AYP led to increasingly punitive interventions for many public schools. If a school failed to meet AYP for 2 consecutive years, the school system was supposed to offer students a choice of another school that was able to achieve AYP (Hess & Finn Jr., 2007). After three years of failing to meet AYP, the school system was required to offer supplemental educational services to students, including after school tutoring (Hess & Finn Jr., 2007). If a school failed to meet AYP for enough years consecutively, the school was subject to drastic restructuring measures that might include the replacement of the principal and staff and a complete takeover by outside entities, such as consultants, private firms, and the state (Hess & Finn Jr., 2007).

The advent of NCLB led to increased emphasis on mathematics and reading instruction in all of the tested grades as schools strived to achieve AYP, and science education was placed on the "backburner in the face of curricular demands" (Levy, Pasquale, & Marco, 2008, p. 2). According to Levy, Pasquale, and Marco (2008), science instructional time in elementary schools decreased in numerous districts because of the increased pressures in other disciplines. According to Nelson and Landel (2006), students who do not receive effective instruction in science curriculum at an elementary level rarely catch up to students who do receive effective science instruction. Coincidentally, high-schools became accountable for science achievement according to NCLB during the 2007-2008 school year (Levy et al., 2008). Essentially, high-school science teachers were asked to meet the stringent demands of accountability, but their students did not have the prerequisite knowledge to be successful with the science curriculum (Nelson & Landel, 2006).

School Level Factors for Reform: The Importance of Teachers

Marzano (2003) identified five school level factors that positively affect student achievement. These factors are a) a guaranteed and viable curriculum, b) challenging goals and viable feedback, c) parental and community involvement, d) a safe and orderly environment, and e) collegiality and professionalism among staff and teachers. A teacher's belief that he or she is able to bring about learning is fundamental to the process of education. According to Conley (2003), "Almost no one went into teaching with the primary goal of implementing state policies" (p. 163). The most important factor for school improvement is not programs or policies, but it is the people who are in classrooms (Whitaker, 2004).

Ingersoll (2002, 2003a, 2003b) utilized the Schools and Staffing Survey (SASS), and the Teacher Follow-up Survey (TFS), conducted by the National Center for Educational Statistics (NCES), to identify reasons for teacher attrition and dissatisfaction. The survey questionnaires sampled approximately 55,000 teachers and 12,000 administrators from varying types of schools in all states. Ingersoll's analysis examined school characteristics and conditions to identify the reasons for teacher turnover and attrition. According to Ingersoll, 90% of all new teacher jobs are a result of teacher attrition and not simply an aging workforce. The number of teachers who migrate from one school to another school accounts for about half of the teacher turnover in schools.

According to Heller (2004), "While the number of teachers is decreasing, we are at the same time making entry into the profession more difficult" (p. 3). The need to find science teachers of high quality is imperative because of the NCLB mandates for science teachers (Miller & Davison, 2006). According to Miller and Davison, "highly qualified" science teachers must have an academic major in the area that they teach, coursework equivalent to an undergraduate degree, and a professional license in the area that they teach. The findings of the Miller and Davison study indicate that the label of "highly qualified" may not necessarily make an individual a better science teacher. A final assertion made by Miller and Davison indicates, "Teacher dispositions like collegiality, self-reflection, collaborative and interactive skills, and the ability to adjust personal and professional practice based on reflection are important characteristics of good teachers" (p. 58).

Approximately 50% of all teacher turnovers are a result of teacher dissatisfaction with factors such as school administration, lack of student motivation, student discipline

problems, and, finally, a lack of influence in the decision-making of the school policies (Ingersoll, 2002). Ingersoll (2002) implicates four strategies to decrease teacher turnover: a) increasing teacher salaries, b) improving student behavior, c) increasing teacher influence over school decision-making, and d) increasing administrative support of teachers.

According to Mangrubang (2005) and Ingersoll (2003a), science teachers are leaving the profession at a rapid pace for reasons other than retirement. According to Ingersoll (2003a), 40% of math and science teachers leave the profession because of job dissatisfaction compared to 29% for all other areas. The reasons indicated for job dissatisfaction include (a) salary, (b) poor administrative support, (c) student discipline problems, (d) lack of influence and autonomy, (e) poor student motivation, (f) poor opportunity for professional advancement, (g) inadequate time to prepare, (h) intrusions on teaching time, and (i) class sizes too large (Ingersoll, 2003a). Much of the emphasis in science teacher staffing is to recruit new people to the profession of science education, but according to Mangrubang (2005), little effort has been made to retain science teachers. Davis, Petish, and Smithey (2006) identify five areas that science teachers must understand in order to be successful: a) content and disciplines of science, b) learners, c) instruction, d) learning environments, and e) professionalism. The current educational reform policies amplify the challenges of teaching science successfully, and the increased accountability of school reforms increases the difficulty of teaching successfully.

According to Zemelman, Daniels, and Hyde (2012), effective science instruction includes several qualities that are not evident in other disciplines. Effective science instruction a) builds on student curiosity about the world, b) immerse students in doing

science, c) enable students to use scientific explanations in the natural world, d) enable students to understand the development of scientific knowledge, e) enable students to generate scientific evidence and explanation, f) enable students to participate in scientific practices, g) integrate engineering and science, and h) build on prior knowledge while recognizing conceptual change (Zemelman et al., 2012). However, the standardization of classrooms and assessments often leads to the overemphasis on low-level assessments (Jacobs, 2010).

Economic Reality

In recent years, Georgia schools have made difficult choices with regard to teacher pay and school schedules. Numerous schools have adopted modified school schedules to combat the economic stresses associated with the difficult financial times. For example, schools have adjusted their calendar to have fewer school days, longer hours, no class size restrictions, and furlough days for teachers. These interventions have had an effect on teacher efficacy and will ultimately have an effect on student achievement. Schools have been pressed by NCLB to meet AYP in the current climate of economic uncertainty. However, the recent NCLB waivers may change the experiences for teachers as they begin to adjust to their new realities, as many teachers are faced with the realities of Race to the Top (RTTT) and new evaluation systems. Schools are still attempting to make reform efforts in an already stressful environment in an effort to improve.

Rural Teachers

The concept of "rural" is a difficult concept for many individuals to grasp. According to Barter (2008), rural school systems may be defined by their relative size,

location, or position of the school in the community. Most schools located in south Georgia may be defined as rural according to this criterion, and the teachers must contend with factors that are unique to this situation.

Carlsen and Monk (1992) utilized data from the Longitudinal Study of American Youth (LSAY) to identify information regarding science teacher training and student performance over a multi-year study. The study sampled 456 middle and secondary teachers from rural, urban, and suburban areas. According to Carlsen and Monk (1992), rural science teachers are less experienced, more likely to have taught subjects other than science, less likely to have majored in science, and less likely to have a graduate degree than science teachers in other environments. Carlsen and Monk indicate that ruralness is negatively related to school performance. Three suggestions made by Carlsen and Monk are a) to provide compensatory assistance to rural schools, b) eliminate the sources of rural difficulties, and c) to wait it out regarding teacher attrition and replacement.

Eppley (2009) conducted a critical analysis of the highly qualified teacher provision of NCLB with regard to rural teachers. According to Eppley (2009), a teacher is considered highly qualified if he or she holds a bachelor's degree, and a teaching license, and demonstrates knowledge in the subject areas that he or she teaches. Eppley (2009) identifies a disconnect between the language of the highly qualified provision and the realities of many rural school systems. Therefore, teaching in rural communities requires different skills and characteristics than teaching in urban or suburban communities.

Beesley, Atwill, Blair, and Barley (2010) identified numerous barriers to the recruitment and retention of teachers in rural school systems. These barriers may include

salaries, school populations, and locations. According to Beesley et al. (2010), many principals recruit individuals with personal experiences in rural areas to help overcome the challenges associated with working in rural areas. To improve recruitment and retention of teachers in a rural community, administrators should focus on community characteristics, recruit from rural areas, use induction programs, and decrease the isolation of teachers through mentoring (Beesley et al., 2010). Individuals who are familiar with the nuances of living and working in rural areas may be more likely to continue working in the rural areas (Burton & Johnson, 2010).

In a study conducted by Burton and Johnson (2010), they created portraits of two teachers who taught in rural schools. The individual teachers in the study worked in rural communities because they believed that they could not teach in any other type of environment. According to Burton and Johnson, the teachers are successful because of many inherent qualities that may not be identified by the traditional characteristics of *highly qualified* teachers. The subjects of the study identified numerous challenges with regard to the rural communities, and the authors identify a need for further research into the area of rural education (Burton & Johnson, 2010).

When attempting to staff rural schools, many principals have resorted to recruiting career-changers to fill many of the employment gaps (Fry & Anderson, 2011). Career-changers are required to deal with the same issues as younger teachers, but they may have additional traits or characteristics that help them cope with the challenges of teaching (Fry & Anderson, 2011).

School reform initiatives oftentimes do not focus on the needs of rural school districts (Bryant, 2010). For example, rural schools that are unable to make AYP may be

placed under sanctions, but there are no alternatives for the schools. National reforms often call for the development of charter schools, but in rural areas, charter schools may not be feasible to staff or develop (Bryant, 2010; Ravitch, 2010). Therefore, many school districts have resorted to using packaged reform efforts and outside consultants to implement school reforms and influence school change models.

Recruitment and Retention of Teachers

The roles of policy-makers and principals in the quality and retention of science teachers is identified by Shen, Gerard, and Bowyer (2010). The authors identify several differences between the ideas of policy-makers and principals regarding science education. For example, federal and state policy-makers suggest ways to decrease credentialing requirements to recruit teachers from corporate areas, but according to the authors, many of the newly recruited teachers lack the commitment required to continue teaching. Even though new teachers may be recruited from corporate areas, the transition from the corporate world to the educational world may prove to be too much for the new recruits.

According to Lowe (2006), "The most critical factor to be considered in teacher recruitment and retention is that schools must be effective and provide teaching and learning environments that are attractive" (p. 28). With regard to teacher recruitment and retention, administrators are responsible for welcoming teachers, establishing school community, providing mentoring for new teachers, investing in quality staff development, focusing on planning, and offering additional incentives for high quality teachers.

Good working conditions are critical for the stability of schools (Green, 2003; Van Roekel, 2011). Teachers who leave teaching before retirement often cite stress and low pay as the reasons for leaving (Brown, 2011). If teachers do not perceive their needs as being met, then there is very little chance that the needs of the students will be met either (Whitaker et al., 2009).

Watlington et al. (2004) conducted a multi-year study of teacher retention and found several interesting facts. In the study of 2,129 public school teachers hired in south Florida, four trends occurred regarding teacher retention (Watlington et al., 2004). In general, males, out-of-state teacher hires, and out-of-field teacher hires were more likely to leave the teaching profession than were the corresponding alternates (Watlington et al., 2004). Also, one of the school districts had a significantly higher teacher retention rate (80.5%) than the other three school districts within the study. The factor identified by Watlington et al. (2004) as a possible reason for the improved teacher retention was the presence of the New Educator Support System (NESS), which included mentoring, staff development, and technical assistance for new hires.

Yost (2006), conducted a qualitative study of 17 teachers to determine their experiences regarding their first year of teaching, current views and successes, and their ability to use critical reflection to solve problems. Yost made several propositions regarding teacher efficacy and teacher retention. For example, teachers with high efficacy will often leave seemingly unsupportive environments rather than leave the teaching profession. Yost (2006) noted the effect of positive experiences during student teaching or field experiences had on improving teacher confidence and self-efficacy.

Killion and Harrison (2006), identified the necessity for schools to begin utilizing their best and brightest teachers to serve as coaches for other teachers within schools to support and improve the instructional practices of teachers in schools. According to Killion and Harrison (2006), many of the reform efforts have focused on an outside-in approach, but they have had mixed results for school improvement. An instructional coach has the ability to serve multiple roles for his or her co-workers (Killion & Harrison, 2006). Several of the possible roles held by instructional coaches include a) resource provider, b) data coach, c) curriculum specialist, d) classroom supporter, e) mentor, f) learning facilitator, g) school leader, h) catalyst for change, and i) learner (Killion & Harrison, 2006). Through the use of instructional coaches and the coaching cycle, teacher efficacy may be increased as teachers are introduced to new concepts and strategies and they are provided with the necessary support to help them properly implement the new concepts and strategies. Killion and Hirsh (2011) identified professional learning walks, tuning protocols, and lesson studies as activities directed by instructional coaches that may contribute to the overall improvement of instruction within a school.

Effect of Efficacy

Self-efficacy is the belief in one's ability to produce given outcomes or results (Bandura, 1977, 1997). In general, a person's self-efficacy beliefs affect the individual's ability to cope with stressful situations and determine how much effort that individuals will exert or expend in the face of obstacles or aversive experiences. Self-efficacy beliefs are often measured using standard quantitative measures. Bandura (1977, 1997) presented individuals with items portraying different task demands and required

individuals to rate the strength of their ability to complete the activity. Self-efficacy beliefs may change over time, and they are the result of numerous events and factors in an individual's life.

Gibson and Dembo (1984) describe teacher-efficacy as the degree to which teachers believe they can teach students in spite of the students' IQ, home, family, and school conditions. According to Gibson and Dembo (1984), teachers who have high teacher-efficacy beliefs a) persist to get answers, b) redirect students easily, c) have more students on task, d) have more student engagement, and e) have higher expectations for student. Teachers with low teacher-efficacy beliefs a) gave up on answers, b) lacked "withitness," c) gave up on lower performers, and d) criticized student more often. Teacher-efficacy may be situational or organizational. Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) combined the efforts of numerous researchers into a comprehensive measure of teacher-efficacy. Tschannen-Moran, Woolfolk Hoy, and Hoy argue that teaching efficacy is context-specific and that a teacher's efficacy ratings will change with the context in which the teacher is located. For example, teachers who are teaching out of their content domain will not feel as efficacious as teachers who are working within their specific content domain. According to Yeung and Watkins (2000), studies on teacher efficacy rely mainly on questionnaires and surveys, and teacher efficacy levels out as a result of years of experience.

According to Ross and Bruce (2007), teacher-efficacy is self-perception, and not a measure of teacher effectiveness. However, teachers who score higher on teacher-efficacy scales a) try new ideas, b) stimulate student autonomy, c) attend closely to lower ability students, and d) change student perception of ability. Throughout the Ross and

Bruce study, teacher-efficacy decreased because of the uncertainty of new practices, but increased as teachers saw student success with the new practices. Teacher-efficacy beliefs increased as teachers saw themselves as successful, and the teachers observed others similar to themselves as successful.

Kurz and Knight (2004) conducted a study that explored the relationships between teacher efficacy, collective efficacy, and goal consensus. The Kurz and Knight (2004) study found that personal teaching efficacy and general teaching efficacy were significant predictors of collective efficacy. According to Kurz and Knight, collective efficacy may explain the different effects that schools have on student achievement. One assertion made by Kurz and Knight is the idea that a relationship exists between these variables, and strengthening one area may have a positive effect on the other variables and ultimately lead to higher student achievement.

Teacher Longevity

The current structure of the United States teaching force includes a large population of teachers nearing retirement and a large population of teachers who are entering the teaching profession, but very few teachers in between the two extremes (Johnson, 2011). Another noted demographic trend is an increase in the percentage of teachers who are entering the teaching profession as mid-life career changers (Johnson, 2011). The current age structure paradigm may create generational differences between the new and older teachers. According to Johnson, when these cohorts hold different views, the effectiveness of schools may be undermined, but if these cohorts work effectively with each other, both groups may benefit.

The greatest resource for school improvement is the knowledge and skill of the best and most experienced teachers (Darling-Hamond, 2003). Teacher's salaries, working conditions, teacher preparation, and mentoring support have been identified as factors that may influence teachers to continue in education (Darling-Hamond, 2003; Ingersoll, 2002; Watlington et al., 2004; Whitaker et al., 2009).

Bobeck (2002) identified resiliency as one key to career longevity. The factors identified by Bobeck (2002) that contribute to the development of resiliency are significant adult relationships, a sense of personal responsibility, a sense of competence, confidence, a sense of humor, a sense of accomplishment, and social and problem solving skills. The development of resiliency in the face of changing educational conditions is essential to the retention of teachers.

The Effect of School Reforms

Fullan (2001) and Sarason (1996) describe the importance of school culture on reform efforts. According to Sarason (1996), "The following strategies were frequently *ineffective* because they were not consonant with the conditions of school district life or with the dominant motivations and needs of the teachers: outside consultants, packaged management approaches, one-shot pre-implementation training, pay for training, formal evaluation, and comprehensive projects" (p. 76). Ravitch (2010) questions the long-term effectiveness of the top-down blanket reform efforts that took place in San Diego and New York City and the effects that these reform efforts had on the school systems.

Richard Elmore (2007), identified many of the gaps between school policy and practice. Several of his assertions identify the main difference between failing schools and successful schools as the socioeconomic statuses of the students that attend the

different schools. For example, Elmore (2007) identified two schools that were labeled as failing by NCLB. These *failing* schools made vast improvements, but because of the sliding scales associated with NCLB, the schools would not leave the Needs Improvement list. The final assertion made by Elmore (2007) regarding school improvement and reform is the concept that major differences exist between schools, and that many schools reflect the performance capability of their students. Therefore, many schools are doomed to failure according to the current standards regardless of the effort and attitude of the teachers involved.

According to Young (2012), if school improvement is done properly, then schools will actually improve. However, the current models of school improvement fail to take into account the individuals responsible for implementing the policies. If schools will acknowledge the *voices* of the individuals involved in the school improvement process, then the schools will make the necessary changes to improve (Young, 2012).

The Common Core and the Next Generation Science Standards

According to Rothman (2013), 46 states have adopted the CCSS, but successful implementation of the standards will require adequate funding for professional development, assessments, and curricular materials. Shanahan (2013), provided a brief synopsis of the CCSS. According to Shanahan (2013), the CCSS will provide students with increased opportunities for students to learn about science through using literacy strategies. Essentially, students will be provided increased literacy instruction through reading informational texts in science and history in the earlier grades and ultimately at the high school level (Shanahan, 2013). According to Alberti (2013), the CCSS will

require students to a) build knowledge through content-rich nonfiction, b) read and write providing evidence, and c) practice with complex texts and academic language.

The implementation of the skills required by the CCSS will require a different type of assessment from the traditional paper-and-pencil test (Doorey, 2013). The U.S. Department of Education awarded grants to the Partnership for the Assessment of Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium to produce assessments that are aligned with the CCSS (Doorey, 2013). The new assessments will be administered on computers or other digital devices, and will require students to perform higher level tasks (Doorey, 2013). According to Doorey (2013), the assessments will utilize the interactive nature of the computer software to identify students who meet, exceed, or are below the standards.

Brooks and Dietz (2013) identified many of the possible pitfalls associated with the adoption of the CCSS and the accompanying assessments. According to Brooks and Dietz (2013), the standardization of the national curriculum will decrease the diversity of curriculum, instructional practices, and assessments. Because of the importance of test scores, the characteristics of critical thinking and creativity will be decreased because of the necessity for high test scores (Brooks & Dietz, 2013).

According to Krajcik (2013), "The overall goal of the *Framework* and the NGSS is to help all learners in our nation develop the science and engineering understanding that they need to live successful, informed, and productive lives that will help them create a sustainable planet for future generations" (p. 27). The NGSS uses five key ideas from the *Framework for Science Literacy* (Krajcik, 2013). The five key ideas are a) limited number of core ideas, b) cross-cutting concepts, c) engagement in scientific and

engineering practices, d) integration of concepts, and e) ongoing developmental process (Krajcik, 2013).

According to Bybee (2011), the inclusion of the scientific and engineering practices in K-12 classrooms will result in one of the greatest fundamental shifts for many science teachers. The inclusion of engineering practices will require students to think systematically about scientific content, and ultimately apply the new concepts that they learn (Bybee, 2011). The inclusion of scientific practices will move students away from simple recall and knowledge-based activities towards higher order thinking skills (Bybee, 2011). According to Bybee (2011), "When students engage in scientific practices, activities become the basis for learning about experiments, data and evidence, social discourse, models and tools, and mathematics and for developing the ability to evaluate knowledge claims, conduct empirical investigations, and develop explanations" (p. 38).

The increased emphasis on cross-cutting ideas in the NGSS increase the necessity for vertical alignment of science curricula (Duschl, 2012). Science teachers will need increase their knowledge of the concepts taught by earlier grades, and the NGSS will provide a progression of concepts from kindergarten throughout high school (Duschl, 2012). Ultimately, if the NGSS is properly implemented, silos of knowledge from grade to grade, and from discipline to discipline will be eliminated to produce a comprehensive science education for all students.

Summary

Numerous school reforms have occurred since the publication of *A Nation at Risk*. The three identified eras of reform are the era of crisis, the era of standards, and the era of

accountability. Through the eras, the variable that has remained steadfast has been the teachers. Science teachers oftentimes face insurmountable odds and ridicule as the pressure to improve has increased for teachers, but decreased for students. The difference in accountability for students and teachers has caused many science teachers to choose a different profession (Ingersoll, 2002, 2003a).

According to Tyack and Cuban (1996),

> Certain calls for change seem to have recurred again and again in cyclical fashion, often within the lifetime of individual educators and sometimes at a dizzying pace, as in the last generation. Reformers, for example, have alternatively proposed student-centered pedagogy or teacher-centered instruction, attention to academic or to practical knowledge, and centralized or decentralized governance of schools" (p. 41).

Many of the implemented policy changes occur before the previous policy changes may have an effect on student achievement (Tyack & Cuban, 1996). The time delay between implementation and action inevitably causes great stress among the educators who must implement the reforms. For teachers, the number of reforms and demands placed upon them by outside forces may seem insurmountable as they attempt to cope with the stresses of the profession of teaching and meeting the demands of policy-makers (Tyack & Cuban, 1996).

The introduction of the CCSS and the NGSS provide an educational intersection for science education. The manners in which these new standards and curricula are implemented determine the success of the standards to promote the necessary reforms and change for science education. Numerous authors have described the problems with educational reform and change with regard to teachers and their belief systems (Elmore, 1996, 2007; Goodlad, 2004; Ingersoll, 2003b; Ravitch, 2001, 2010; Sarason, 1996; Tyack & Cuban, 1996; Young, 2012). Many groups blame schools for their inability to achieve

high student success rates on multiple standardized tests, and teachers are often left as the scapegoat for low achievement on these tests (Ravitch, 2010; Young, 2012). The increased pressure for success and the decreased amount of control held by teachers for their success places teachers into the category of *an oppressed group* (McLaren, 1989). As an *oppressed group,* teachers deserve to have a *voice* in the matters of school reform and school change policies (McLaren, 1989; Young, 2012).

Chapter III

METHODOLOGY

I wanted to discover the perspectives and experiences of rural science teachers who have taught since *A Nation at Risk* was published in 1983. A blended methodology of case study research and portraiture was used to convey the perceptions and experiences of master rural science teachers in south Georgia. The completed case studies of science teachers and the cross-case analysis illustrate the essence of teaching science in rural south Georgia through the eyes of teachers and help answer the following research questions.

1. What have been the experiences and perceptions of master science teachers with school reform and improvement in rural Georgia?
2. How can the experiences and perceptions of master science teachers in rural Georgia guide school reform and improvement in the future?

Qualitative research methods were selected for this study because the primary goal is to describe and explain the experiences and perspectives of science teachers who have remained educators since the publication of *A Nation at Risk.* According to Sara Lawrence-Lightfoot, "Portraiture resists the tradition-laden effort to document failure" (Lawrence - Lightfoot & Hoffman Davis, 1997, p. 9). "Portraiture is a method framed by the traditions and values of the phenomenological paradigm, sharing many of the techniques, standards, and goals of ethnography" (Lawrence - Lightfoot & Hoffman Davis, 1997, p. 13). Traditionally, phenomenological studies are concerned with the

concept and perception of power within organizations and the experiences of individuals with shared power (Moustakas, 1994). The resulting case studies of successful science teachers will illustrate the perceptions and beliefs of science teachers regarding school reform since the publication of *A Nation at Risk.*

The study of science teacher experiences and perceptions of school reform was conducted using in-depth interviews with science teachers. The primary tool for conducting phenomenological research is the interview (Seidman, 2006). According to Stake (2000), "When researchers are not there to experience the activity for themselves, they have to ask those who did experience it to make empirical data more objective and less subjective, the researcher uses replicative, falsification, and triangulation methods" (p. 455). Interviews provide the researcher with a description of the *essence* of the experience as perceived by the research subject and allow the researcher to clarify misconceptions or misunderstandings between the subject and the researcher. According to Seidman (2006), "The purpose of in-depth interviewing is not to get answers to questions, nor to test a hypothesis, and not to 'evaluate'" (p. 9). The primary way to investigate human experience over a prolonged period is through interviews.

According to Sarah Lawrence – Lightfoot (1997), "Portraitists seek to record and interpret the perspectives and experience of the people they are studying, documenting their voices and their visions – their authority, knowledge, and wisdom" (p. XV). The goal of this study is to *give voice* to the teachers who have lived through the multiple school reform efforts and allow their stories and recommendations to influence the policies and practices of administrators, policymakers, and school reformers when developing and implementing school improvement practices.

Participants

I wanted to discover the manner in which the many educational reforms have affected science teachers. Science teachers who have been in the profession for over 20 years are a rarity, and the experiences of these teachers should be explored to determine the effects of school reform on the multiple beliefs, behaviors, and attitudes of science teachers as they mediate the differences between the realities of teaching science and the numerous school reform policies.

The in-depth nature of portraiture and case-study research calls for a small, intentionally chosen group of participants. I utilized snowball or chain sampling strategies to identify information-rich cases for in-depth study (Patton, 2002). The initial criterion for selection is having taught science for a minimum of 20 years in predominantly rural school systems. The teachers selected were located within relatively close proximity to each other, and they were studied for an extended period of time (Miles & Huberman, 1994). After meeting the initial criterion of teaching for a minimum of 20 years, the merits of the individuals in the study were validated through the achievements and commendations that the selected teachers have received over their careers.

At the beginning of the study, I contacted seven individual teachers who met the selection criterion using either electronic mail or the telephone. Once I made the initial contact, I provided the research participants with a copy of the Valdosta State University Institutional Review Board consent form located in Appendix B, and I explained the interview and data collection process that would be used to complete the data collection. The research participants were informed that they would be provided with a copy of their

completed case-studies to provide direct input into the portrayal of their thoughts and experiences. The research participants were informed that they would be provided with a pseudonym, and that their participation in the study will remain private and confidential.

Biographical information about the three research participants is found in Table 1

Table 1

Profile of Research Participants

Amy	Educational History: 1978 – B.S., Chemistry 1981– M.S., Chemistry 1983– Ph. D., Chemistry Professional History: 1984 – 1991 – Professional Chemist (Research) 1991 – 2007 – High School Teacher (small rural school) 2007 – Present – High School Teacher (large rural school) Awards: 2002 – 2003 Star Teacher 2005 – 2006 Excellence in Educational Pedagogy Award 1996-1998, 2009 United States National Chemistry Olympiad Mentor

Continuation of Table 1: Profiles of Research Participants

Lauren	Educational History: 1972 – B.S.Ed., Broad field Science 1977– M.Ed., Biology Education 1990– Ed.S., Broad field Science Professional History: 1972 – 1978 – High School Teacher 1978 – 2002 – High School Teacher 2002 – 2012 – Science Specialist and School Improvement Specialist Awards: 1968 – High School Valedictorian 1970 – Freshman Physics Award – Valdosta State University 1972 – Highest GPA – Valdosta State University 1988 – Advanced Technology Development Center Outstanding Science Teacher 1989 – Georgia Power Outstanding Science Teacher Award 1990 – Outstanding Education Specialist Student at VSU 1996 – Tandy Technology Scholars Outstanding Science Teacher 1996 – Sigma Xi Outstanding Science Teacher 1989, 2001 – Georgia Teacher of the Year Finalist 1983, 1985, and 1996 – STAR Teacher – High School
Elizabeth	Educational History: 1981 – B.S. Biology 2006 - M.Ed. Secondary Education Professional History: 1981 – 2009 – High School Teacher (same school) 2009 – Present – Instructional Leader Awards: Star Teacher Star Teacher High School Teacher of the Year High School Teacher of the Year

Settings

The interviews took place in a location and at a time that was the most comfortable and convenient for the research participants (Seidman, 2006). Because of the scheduling difficulties and the demands of the teaching profession, I made concessions to accommodate the needs of the research participants. On more than one occasion, I rescheduled an interview to meet the needs of the research participants. For example, one of the participants was forced to deal with a death in the family during the interview window, and the necessary concessions were made to accommodate her needs.

For the purpose of this dissertation, all of the interviews and data collection took place in a rural setting. According to Barter (2008), rural schools may be defined by several criterion that may not be quantifiable. Rural schools are central to the community, and many community residents depend on the school for their personal identities. Rural schools may be large or small, but they are often the only educational option for nearby residents. In rural south Georgia, many counties only have one public option for students to obtain their education, and often-times the students who attend these community schools are required to travel many miles before they finally reach their school. The participants in this study have spent many years working in schools that meet this definition of rural, and a further description of the individual participants' settings is provided in the case-studies found in Chapters 4, 5, and 6.

Methods of Data Collection

According to Yin (2009), "Case study evidence can come from many sources" (p. 99). The data sets for this dissertation include tape recorded interviews, transcripts, resumes, anecdotal notes and reflections, and electronic mail communications. The

primary data source is the in-depth interview, and the other data sources are used to validate and inform the cases.

Seidman (2006) recommends using a series of three, ninety-minute, interviews to conduct a phenomenological study. The interview guide is located in Appendix A. The first interview focused on the teacher's life history. The second interview focused on the details of the experience of teaching science in rural south Georgia. The third interview included a reflection and clarification of the previous two interviews. The interview structure provides an understanding of the subject's experiences as a science teacher, and if the structure of the interviews is lost, then the effectiveness of the interviews is lost (Seidman, 2006). Table 2 provides the dates that the interviews occurred. Appendix A includes the interview guide and questions that were used to discover the experiences and perceptions of science teachers in rural south Georgia.

Table 2

Schedule of Interviews

Amy	Interview 1 – 11/16/2012 Interview 2 – 11/30/2012 Interview 3 – 12/07/2012
Lauren	Interview 1 – 12/26/2012 Interview 2 – 01/05/2013 Interview 3 – 01/12/2013
Elizabeth	Interview 1 – 01/10/2013 Interview 2 – 02/06/2013 Interview 3 – 02/13/2013

Teacher resumes were used to verify the interview dates and to provide additional information regarding the numerous awards, grants, and fellowships that the teachers may have received over the course of their careers. During the compilation of the cases, the teachers were contacted by electronic mail or telephone to fill in any of the data gaps that may have occurred in the process of completing the study. Participants were provided with copies of their case study to review for consistency and for the accurate portrayal of their thoughts and beliefs regarding the various topics (Miles & Huberman, 1994).

Methods of Analysis

Following the procedures outlined by Seidman (2006), Yin (2009), Miles and Huberman (1994), and Stake (2000) the data was analyzed, themes were identified, and cases were developed. Using Atlas.ti software for qualitative analysis, the transcripts were uploaded and read electronically. In a column adjacent to the transcript, I noted examples of defining events and these defining events became codes for the development of cases. For example, on the first case, a science teacher describes an event in which she receives praise from one of her students' parents for being a tough, but caring teacher. This instance is coded as satisfaction in Atlas.ti because she said that she "felt a sense of satisfaction" from the event. The process of reading and re-reading the text to code the data continued throughout. The constant comparative analysis of the text continued throughout the development of cases and increasing amounts of data presented (Huberman & Miles, 1994). In the initial reading of the cases, 34 codes were identified. During the analysis of the cases these codes were collapsed into 10 themes that provided the framework and headings for each case.

According to Seidman (2006), "The first step in reducing the text is to read it and mark with brackets the passages that are interesting" (p. 117). For the purpose of this dissertation, *interesting* is defined by moments in the interviews in which the participants either confirmed or negated assumptions that were created throughout the literature review. Examples of items that may have piqued my interest regarding the experiences and perceptions of my research participants include a) examples of defining moments in which a job, responsibility, or decision was made as a result of a type of reform, b) examples of political pressures experienced by teachers and the subsequent choices made by teachers, c) examples of emotional fallout and stresses, d) examples of intensive pressures in teaching and added professional responsibilities, e) examples of challenges to address unknowns, and f) and examples of moments when teachers had to invent solutions to problems posed by policy mandates.

Cases consist of individual portraits that are created from each series of interviews using procedures identified by Lawrence-Lightfoot and Hoffman Davis (1997). The cases also include a description of the setting in which the interviews take place, an individual history to document the lived experiences of the participant, and a thorough description of the participants' current situation and beliefs regarding the issues of school reform. The research participants received copies of their case studies upon completion and the research participants were given the opportunity to provide any information or make corrections if they wished.

The completed descriptive cases found in Chapters 4, 5, and 6 provide the data-base for cross-case analysis. Once all three individual case studies were developed, a cross-case analysis was conducted using the already identified themes and code

examples. Again, a constant comparative analysis process was used across three cases to identify similarities and some differences. From this analysis four overarching themes were identified from the perceptions and experiences of all three science teachers.

The effects of the rural lifestyle, standards and assessments, administration, and reforms and policies were identified as the lenses that shaped the experience of the teachers that participated in this study. The rural lifestyle is defined as the component of the teachers' surroundings and personal experiences that helped shape their perception of school reform. The effect of standards and assessments is defined by the perceptions that the teachers have regarding the effects of the implementation of standardized testing and the standards based classroom movement. The effect of the administration is defined by teachers' perceptions of the ability of an administration to mediate the effects of school reforms. Finally, the effect of school reforms regards to the perceptions that the teachers have with regard to the implementation of the NGSS and the CCSS and the future of these reforms.

Threats to Validity

Maxwell (2005) identified researcher bias and reactivity as two broad threats to validity in a qualitative study. The primary method to eliminate the problem of reactivity is an intensive, long-term involvement with the research subjects (Seidman, 2006). The use of three structured interviews to gather information regarding life history, details of experience, and a reflection on the meaning of the previous two interviews will provide an extended period interaction with the research subjects. A second method to increase validity is the collection of *rich* data. All interviews were recorded and transcribed completely before they are analyzed for consistencies, and detailed notes were taken

throughout the research process. A third method to increase validity in a qualitative study is the use of *member checks* of the research subjects to ensure that the data gathered matches the beliefs of the individuals. The research subjects were provided with completed copies of the case studies to read and provide additional insight and corrections if necessary.

Researcher bias could have affected the outcome of the study. Numerous readings and articles have influenced my beliefs regarding school reform and change. Through the use of numerous checks and balances, my biases should be decreased by the completion of this study. The use of member checks, longevity, and rich data collection should work to decrease the amount of researcher bias that is present. Data saturation and redundancy of data improve the validity of the study.

Chapter IV

CASE STUDY: AMY

The research participants exhibit characteristics of resilience, excellence, integrity, and perseverance. *A Nation at Risk* **(**1984**)** pointed a finger at educators and reported that the majority of individuals entering the teaching profession were undereducated and unprepared to properly teach the youth of America. The individuals studied in this dissertation are highly qualified and counter to the claims reported in *A Nation at Risk.* One such chemistry teacher was interviewed about her experiences and perceptions of school reform and in this case study, she shares her *voice*.

Beginnings

As I drove up to Amy's high school, I was in awe of the size of the school. The first interview took place on the Friday afternoon before Thanksgiving break. She greeted me in the front office to guide me to her classroom for our first interview. Amy's classroom was located in a remote area of the building. In our messages regarding the location of her classroom, she jokingly said, "LHS has hidden the chemistry teachers far away from the administrators. I guess they will blow something up" (E-mail correspondence, 11/07/12). On the way to her classroom, Amy mentioned the relatively few visitors to her classroom as a result of the remote location, and she seemed to enjoy the isolation that her department has with regard to the rest of the school, and the ability of her department to fade into the background of the school.

Amy's willingness to participate in the research process was refreshing, but our e-mail correspondence exhibited a light-hearted approach to the research process as well. In our first correspondence, she described working with "pesky dissertation committees" and the benefits of completing her program in the end (E-mail correspondence, 10/21/12).

Education

Amy's choice of chemistry as a topic of study was guided by a great love of the material. As a high school student, she enjoyed watching the film strips that showed the chemistry labs, test tubes, and lab coats. Amy chose to continue in the area of chemistry because of the relative ease with which she continued through high school, college, and ultimately graduate school.

A review of Amy's resume reveals several details regarding her education. Amy completed her bachelor's degree in chemistry in 1978 at Texas Tech University located in Lubbock, Texas. Upon graduation, she entered a master's program at the University of New Mexico where she graduated in 1981, and she subsequently entered the doctoral program at the University of New Mexico, where she graduated in 1983.

Amy's father, a mechanical engineer, recommended that she become a chemical engineer. According to Amy, her father recommended chemical engineering because he thought that all she could do with a degree in mathematics or chemistry was teach (Personal communication, 1/27/2013). With regard to this decision, she made the following statements.

> I tried chemical engineering through the first half of my sophomore year of college and I decided, that is not what I want to do. I want to work with the test tubes. I didn't care about the chemical plants themselves, and that is what engineers do. They design or keep it (the plants) operating. Engineers make sure the plant doesn't blow up, and I would rather play with the molecules, the atoms, and such. (Interview, 11/16/12)

Upon finding her niche in analytical chemistry, Amy proceeded in her education to study polymers. Amy described her life as a graduate student as a rather interesting one. For example, she said that as a graduate student she lived in the chemistry laboratory for the remainder of her formal education. Amy described her life while working her way through graduate school in the following interview excerpt.

> While I was in graduate school, that (chemistry) was all that I did. I made money through teaching assistantships and research assistantships. So all I did was try to go to graduate school, and I did not try to work and go to graduate school. (Interview, 11/16/12)

Industry

Amy's extensive education in the world of chemistry prepared her extremely well for her first official career as a research chemist at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. While working at LANL, Amy was able to work on a number of projects. According to her resume, she was responsible for researching new ways to use polymers (plastics) for recovery of radioactive elements from nuclear waste, providing specialized polymers for other LANL groups, writing technical reports for projects, and directing technicians. For example, one of her research projects involved creating a special type of plastic that could be used by the National Aeronautic Space Association (NASA) to prevent the space program from having to repaint the space shuttle after every launch. According to Amy, "There were a few projects that I can't tell you about, also" (Interview, 11/16/12).

According to Amy, the working environment at LANL was a very supportive and relaxed working environment. For example, LANL gave her four weeks of vacation time per year, and she was given all of the national governmental holidays. Due to the remote location of LANL, the employees received four days of vacation for every Monday

holiday, as well. Amy worked at LANL for 5 years before she and her husband moved to south Georgia so that he could accept a teaching position at Valdosta State University in the chemistry department.

Upon her arrival in rural south Georgia, Amy discovered that there are relatively few jobs in industry for individuals with doctorates in chemistry. However, she was able to find a job working for the Griffin Corporation in April of 1989 as an analytical chemist. According to her resume, her responsibilities included "developing methods to analyze the ingredients in new products to guarantee percent composition; developing and maintaining good laboratory practices, performing government required tests on new products before the product is placed on the market, and directing work-study students from Valdosta State University."

According to Amy, the working culture at Griffin was very different from the working culture at LANL. For example, as a new employee, she was provided with two weeks of vacation time per year as opposed to the four weeks of vacation time that she received while working at LANL. Another difference between the two organizations was the management philosophies of the organizations. The culture at LANL provided employees with flexibility, and the culture seemed to reward employees for their successes. She notes that the culture at Griffin was much more punitive, and the employees were all judged according to their performance along the "bell curve" (Interview, 12/7/12). Employees were judged according to their ranking at the company, and if there happened to be an employee who had more experience or time working at the company, then there was virtually no way to move up in the company. Ultimately, the lack of substantive vacation time and the punitive nature of the company's culture forced

Amy to make the decision to leave the Griffin Corporation to pursue another avenue of employment.

Teaching Experiences

After almost 8 years working as a chemist in industry, Amy made the decision to enter the field of education. The decision to enter education was guided by two principle factors. The first factor to influence her decision was the mere fact that there are relatively few chemistry positions available in rural south Georgia for Ph.D.s. The second factor that influenced Amy's decision to become a secondary science teacher was her experience working with students while at both LANL and Griffin. According to Amy, she never intended to enter the field of education (Interview, 11/16/12).

Although *A Nation at Risk* called for an increase in the number of highly qualified science teachers, in the local setting of the rural South, despite her knowledge, level of education and professional background in the chemical industry, her experience was regarded as a barrier rather than a strength. According to Amy, "There were three science positions (in the area) open the year that I was hired in Lanier, but only one was offered" (Interview, 11/16/12).

Contrary to the fact that Amy has been published in multiple research journals because of her work in the field of chemistry, her extensive education may have impeded her from receiving a secondary teaching job teaching job in rural south Georgia. According to Amy, "One of the teachers at Lanier said a couple of years later that we weren't all quite sure with the PhD coming in, that you would be able to teach to the students at their level" (Interview, 11/16/12). In spite of the beliefs of her first administration, Amy became an extremely accomplished science teacher over the past 22

years. On top of being named a National Board Certified Teacher (NBCT), Amy has received the following awards, fellowships, and grants: Excellence in Educational Pedagogy Award (2006), Governor's Honors Instructor, STAR teacher award (2003), an Outdoor Classroom Grant, United States National Chemistry Olympiad (USNCO) mentorships (1996-1998, and 2009), and the DOE Teacher Research Associates Program (1994). Amy also had the opportunity to teach a course on Matter and Energy for Middle Grades Education majors at Valdosta State University.

Over the course of her career, Amy has experienced numerous changes, reforms, and trends. She has been able to persevere through all of these experiences, and she has gleaned many insights into the current state of education in rural south Georgia. Her experiences with school reform at both a small rural high school and a large high school provide many insights into the effects of school reforms on science teachers. The various school reforms will be addressed through her experiences in both the small and large high schools.

The Small School

Amy's first school is located in rural south Georgia, and it currently has 375 students. The school population is currently composed of 1% Asian students, 30% Black students, 12% Hispanic students, 64% White students, and 1% multiracial students. The school has 7% students identified with disabilities, and 67% of the students receive free or reduced lunch. At the end of the 2010/2011 school year, 65% of the students taking the Biology EOCT passed, and 79% of the students taking the Physical Science EOCT passed. While at this school, she worked for one principal for 13years, one principal for 2 years, and the last principal for only 1 year. At any given time, three science teachers

worked at this school. While Amy worked at the small high school, she taught biology, physical science, chemistry, physics, and health. The three science teachers were responsible for teaching all of these subjects. While teaching at the small high school, there was a great possibility that a teacher would have students more than once; this situation improved the familiarity between teachers and students.

The Large School

Amy's current school is also located in rural south Georgia, but it has a completely different demographic profile. Amy's current school has 2,908 students. The students have the following demographic characteristics: 10% Asian, 24% Black, 5% Hispanic, 68% White, and 2% multiracial. At the end of the 2010 - 2011 school year, 82% of the students taking the Biology EOCT passed, and 82% of the students taking the Physical Science EOCT passed. While working at this school, she has worked for two head principals, but she has had many different assistant principals perform her evaluations. At the large high school, biology, physical science, chemistry, physics, human anatomy, environmental science, Advanced Placement (AP) biology, AP chemistry, AP physics, and zoology are offered to students. Instead of teaching many different subjects, the teachers are allowed to specialize into content areas. Because of the vast number of students and the large number of teachers, a teacher may not have contact with a student more than once during the student's high school career.

Satisfaction and Disappointments

According to Jupp (2011), "Teachers choose and stick with the profession for lofty reasons: because they want to influence lives, because education matters to their community, and because they love what they teach" (p. 156). Amy describes one of the

motivating factors for her entering the field of education as "seeing the light-bulb go on" whenever a student finally grasps a concept or topic (Interview, 11/16/12). According to Amy, "the spark in a student's eye" is her primary motivation for staying in the profession for 22 years (Interview, 11/16/12).

Chemistry is generally acknowledged to be an extremely difficult content area by the vast majority of students because they are not prepared for the rigors of an upper-level science course. Therefore, chemistry teachers are likely to encounter students who are uninterested and unmotivated, which can make in teaching chemistry extremely difficult. According to Amy, the satisfaction that comes with teaching these students is often a delayed satisfaction. The following interview excerpt provides a glimpse into the factors that motivated Amy to continue teaching regardless of the numerous pressures and stresses.

> Seeing the students succeed. You see one finally, the light bulb goes on. That keeps me going. Like I said, the successes (that students have). I care about the students that are allowed to go the UGA Stars. When they progress and a lot of times I will get thank you notes back (from students). I usually I don't get them while I am in the school year. I usually get them after they go off to college. My best compliment was from one of the school board members at Lanier. We were standing in line at this banquet and he turned around and said, "Derek said you were the one who best prepared him for college." Thank you! And then I heard later, that gentleman was at one of the baseball games and heard some kids kind of bad mouthing me, and he turned around and said, you listen to her, she will teach you something. The satisfaction of knowing you've done it well. (Interview, 12/07/12)

Because of the interpersonal nature of teaching, many disappointments may come over the course of an individual's career. Amy describes her disappointments with regard to her individual students. The students who exhibit the potential to be successful in science, but fail to live up to the expectations of the teacher have led to many of Amy's

disappointments. The following excerpt illustrates the frustrations and disappointments that Amy felt whenever her students let her down. Amy said, "The students who can do it and won't. You know they have the ability to do (the work), but they don't have the will to do it. Just seeing them waste their potential is frustrating" (Interview, 12/7/12).

External Pressures

According to Richard Ingersoll, many teachers become frustrated in the teaching profession because of pressures from administrators and the lack of ability to control their own working environment (Ingersoll, 2003b). In the following quotation, Amy describes this type of frustration with external pressures.

> Another cause of frustration is maybe too many things being piled on you by the administration. Too many things that they (the administrators) want us to do, and sometimes you feel like the administration will just let the teachers do it because they don't want to. (Interview, 12/07/12)

As a teacher, many of Amy's frustrations result from the stress of teacher evaluations and the disproportionate amount of effort that she needs to exert compared to her students. Many times, she would feel that she cared much more about the students' learning the material than her students. The new teacher accountability systems that place increased pressure for students to have higher grades without regard to their effort increase the level of frustration, as well. Because Amy teaches AP Chemistry, she places additional emphasis on having higher numbers of students with 4s and 5s on the AP exam. However, the following excerpt shows the disparity that may occur when the teacher takes more responsibility for student learning than the students.

> They have been focusing more on getting students to take the AP test rather than how they performed on AP tests, so it frustrates me. I'd like to see more 4s and 5s on the AP exam, but I've got students that just don't work hard enough for that. Like I said, I don't feel like I changed that much. To teach the test is to teach the material and the testing will take care of itself. (Interview, 12/07/12)

Overwhelmed

As an educator in a small school, it is easy to become overwhelmed by the enormous numbers of responsibilities. Amy described many of the situations that are often overlooked that lead to teachers' changing schools or, in some cases, professions. As a teacher in a small rural high school, Amy was responsible for numerous things that ultimately led her to change school systems. Some of her responsibilities, in addition to teaching at the small school, included preparing for banquets, planning science trips, planning Grad night, working on school accreditation processes, taking leadership responsibilities, taking departmental responsibilities, sponsoring clubs, and finally teaching multiple science classes each semester. According to Amy's Resume, while teaching at the small high school, she taught biology, physical science, chemistry, physics, applied biology and chemistry, and even algebra II at one point or another over 16 years. However, at the large high school, Amy has only been responsible for teaching AP chemistry and regular chemistry over the last 5 years.

According to Amy, at the small school, science teachers were continually rotating through her department. Year in and year out at the small school, Amy was forced to train and mentor new teachers who would leave after a short time because they had the opportunity to go to a better system or were attempting to find another career. According to Amy, she had to work to find science teachers before the positions were offered because of the school system policies. After 16 years of being "a big fish in a little pond," Amy moved to the much larger school, where her responsibilities have decreased exponentially (Interview, 11/16,12). She is no longer responsible for the entire science department, and she may focus primarily on teaching her courses at an appropriate level.

Teacher Support

Teaching is a tough profession (Ingersoll, 2002, 2003a, 2003b), and many science teachers will leave the profession if they are unhappy in their profession. As it becomes increasingly difficult to find science teachers to enter the profession, it is important to support the teachers who are currently in the profession. Amy spoke at length regarding the importance of supporting new teachers and the importance of stability for the remaining teachers.

When comparing the small high school and the large high school, the importance of stability and support is made evident. For example, at the large high school, teachers are responsible for one preparation, and have multiple teachers with varying experiences for collaboration and instructional support. The increased level of mentorship and the level of the subject matter expertise available at the large high school can be a factor for much of the success of the school.

Amy described an interesting situation regarding her first year and the level of subject matter expertise. Because of the *seniority rules mentality* at the small high school, Amy was assigned to teach biology during her first year of teaching because another, less qualified teacher, taught chemistry. Amy recalls, "I had no help and I started out teaching biology. The other teacher actually had a biology degree, but he wanted to teach chemistry, physics and physical science because he believed they were more fun to teach. Therefore, everything I did in biology I had to figure out from scratch" (Interview, 11/16/2012).

Academic Standards

At the beginning of her teaching career in 1991, Amy used the Georgia QCC to determine the material to teach her students. As a beginning teacher, Amy leaned heavily on the QCC to determine the concepts that she would teach her students. During her first year of teaching, since she taught a course other than chemistry, she was forced her to pay closer attention to the material that she should teach her students. Amy described her use of the QCCs in the following quote:

> I used them as the basis of what I taught, because I guess it is what is required now. Sometimes I didn't get to every one of them. Basically I tried to cover the QCCs. I probably had an idea of what should be taught and then a little bit of that, but I tried to go from the QCCs and say that's what I wanted to cover because there were too many of them. I would not necessarily get to some of them. (Interview, 11/30/12)

As a content area specialist, Amy had an idea about which standards needed to be taught to make her students successful at the next level. She did not necessarily teach every standard over the period of a course, but she would oftentimes *choose* which standards were the most relevant for her students. She describes the process of choosing her standards as a process of mixing and matching the required standards with the material that she also wanted to cover. According to Amy, "Because we had to write the QCCs in our lesson plans or at least the number, I would write down what I was going to do, and I had to match my QCC to it" (Interview, 11/30/12).

Ultimately, the QCC number was written down to satisfy the lesson plan requirements of her administrators. As the *lead teacher* at the small high school, Amy was responsible for the implementation of many of the new curriculum initiatives. According to Amy, she was required to attend the regional curriculum workshops or meetings to bring the information back to her high school. During the implementation

phase of the GPS, Amy was required to attend the professional learning activities to redeliver the information to the other science teachers at the high school.

The implementation of the GPS made a dramatic change in the testing requirements of science students in the state of Georgia. The implementation of the GPS led to implementation of EOCTs for students in content area subjects. The science subjects that have EOCTs are biology and physical science.

According to Amy, a standards-based education is a noble goal for any teacher. It is a noble concept for teachers to teach all students the same material regardless of their background knowledge or ability to meet the prerequisites for a course. Teachers are asked to teach prescribed standards to all of their students before students take a test at the end of the course. Therefore, many teachers must move at a pace that is often too fast for many students to grasp the difficult concepts. The following passage illustrates the frustration that Amy and her students have felt regarding this trend.

> So, I have students struggling at the pace I am moving now. How can I move this stuff any faster? And we are going to have to rethink that and some of my students say that they are in a year-long math course and we are moving too fast. I tell them that they are going to have to petition the administration if they want year-long chemistry. The only way some of these students will be successful is for me to see some of these students for an hour and a half for a whole year because they (the students) are not ready to move at this pace, and they don't do anything outside of class. (Interview, 11/30/12)

Testing, Accountability, and Student Apathy

The requirement for all students to pass the GHSGT to graduate high school added additional pressures and stresses for Amy. Interestingly, to meet the demands of accountability and achievement requirements imposed for graduation, many resulting changes were implemented in the instructional methods to teach students. According to Amy, many students at her school were placed into special remediation classes or had

special review sessions to help them pass the GHSGT. The following passage illustrates some of the ethical practices with which Amy struggled, given the additional external and administrative pressures that occurred as a result of the increased accountability for results of standardized testing.

> I always hoped I never tried to teach the test. I just tried to teach the material, so that students would do well on the test. It seemed to work out, but I just kept the test in the back of my mind. And I tried to generate questions that go with it. (Interview, 11/30/12)

Amy noted that she made cognizant decisions to include many testable items in her lessons. For example, Amy adjusted her test questions to ensure that her students were familiar with and accustomed to answering standardized test questions. She also used many of the formula sheets and periodic tables from the GHSGT to help her students become aware of the items on the GHSGT.

The mere fact that all students were required to pass the GHSGT increased the pressure placed on teachers for students to be successful. At the beginning of the GHSGT in science, many schools struggled to achieve a seventy percent pass rate on the science GHSGT. Amy noted that many schools struggled with student pass rates on the GHSGT until around 2008. The statewide pass rate on the GHSGT went from 74% during the previous administration to 87% in 2008 (GADOE website). Amy describes inequities, variations, and changes among the content areas GHSGT passing rates when she makes the following observation:

> Like I said, that was same time they lowered the requirement for the passing score. See, that is one thing we kind of complained about was the science graduation test; you pretty much had to have 70% of the questions right to pass. We found out later that in English and math it was more like 45%. So no wonder our pass rate isn't as good as yours. We actually think you want to pass and like you said, they reworded the questions and lowered the score. But I have found that for most students that went

> through my class, most of them could make a passing score. (Interview, 11/30/12)

At the beginning of the implementation of the GHSGT, teachers would work to ensure that their students would be successful on the GHSGT so that the students could graduate high school. According to Amy, "we were trying to get them to graduate. It wasn't for our scores, it was that we wanted them to graduate" (Interview, 11/30/12). If the students did not learn the necessary material to pass the GHSGT, then the students would not be able to graduate.

One interesting trend that Amy has noticed since the beginning of the GHSGT and the EOCT is a disparity between attempts to teach the required standards and an increased level of student apathy. According to Amy, many teachers become disenchanted when they feel more responsible for student learning than the students do. It is extremely disheartening when teachers care more about student success than their students. Yet, ultimately, teachers are held accountable for student learning regardless of the amount of effort that the students exert to learn complex material, which leads to an increased level of anxiety among many teachers.

Student Learning and Teaching Methods

As a teacher, Amy believes that she has the ability to teach almost any student if he or she has a desire to learn. However, one trend that Amy has noticed over the course of her career is an increased level of student apathy. According to Amy, "Sometimes I ask myself, why am I more concerned about my students' success than my students?" (Interview, 11/16/12).

According to Amy, one of the biggest changes that has occurred in science education over her career has been the seemingly contradictory results that many of the

school reforms made on schools. For example, as a result of legislative changes, students are now required to pass four science classes in the state of Georgia to graduate from high school. As a result of this requirement, Amy observes, the number of students who are not willing to do the work necessary to learn complex material has increased in the advanced science courses. Concurrently, NCLB mandates an increased emphasis on test scores in reading and math. Therefore, students are provided with additional support and extended time to pass the math and reading standardized tests. Students are required to pass complex science courses to graduate from high school, but they are not provided extended time or support to pass science courses. Amy provides the following example to illustrate the challenges she faces when teaching science content given the increased science requirements for students to graduate.

> I have 24 in my first block and there are probably about six of them that just do not have the mindset or the ability to do chemistry. Quite a few of them take year-long support math courses, and then come to me and I can't take two days to cover something. I can't take twice the time that the math teacher is allowed with year-round support. That has kind of hurt us in chemistry. Because of No Child Left Behind, I guess a lot of students just aren't really prepared. We are trying to keep them. It's a good idea, trying to keep the children in school, but I feel like a lot of them are getting passed on up. (Interview, 11/16/12)

Another trend that Amy has observed regarding her students has been a decrease in either the willingness or ability of students to think for themselves regarding scientific concepts. According to Amy, many of her students seem unwilling to think about problems or do complex concepts in order to apply their learning. The following passage further illustrates the level of frustration that she feels regarding students' abilities to think critically in their learning.

> They are just not ready to do, or they haven't been challenged enough. I feel like that because I will say, "Don't you remember seeing this?" You should have seen this before and they are like no and such, but this is more

> of opinion than anything research based. It is just that you know watching my students that they will not necessarily answer anything without finding an answer in a book. It's got to be in the book for students to understand. For example, this week we talked about solubility in class. I gave them the example of making sweet tea. I asked them, "When do you add the sugar? When do you add it to make the tea sweeter?" You know, the students wanted to find it in the book. I said, it is not in the book. Think about what you are doing. You know you have done this before. (Interview, 11/30/12)

Another trend that Amy has noticed over the last few years is that her students do not attempt to complete many of her open-ended or completion questions on her exams any more. The following quote illustrates this trend, as well.

> They will at least guess on the multiple choice questions. If I ask them to explain something, a good majority of them will not answer that question or they write one word down, for an explanation. If it is not a test, I will say, "If I explain something to you, if you ask me a question, like how do you calculate grams, if I told you add, you know one word is not going to do it, is it?" They just don't want to write out an explanation. They don't. If I ask them a question that requires a little bit of thought, a lot of them will skip it. (Interview, 11/30/12)

School Reforms and Improvement

Amy described many of the school reforms that have occurred throughout her lifetime and career regarding science education. Because of Amy's aptitude in math and science, she was encouraged to take additional courses in math and science and ultimately completed her Ph.D. in chemistry. Amy briefly described the trends in science education over the course of her lifetime and career in the following passage:

> After Sputnik, we needed more math and science, and then we had *A Nation at Risk* and we needed more math and science, and now we are at STEM, and we need more math and science . . . All a sudden, we will just say oops, we are behind everybody. We need to up the requirements and so forth, but as they read something the other day, it's not that we need more people in math and science; we just need better people. " (Interview, 11/30/12).

According to Amy, as a high school student, she was only required to take two high school science courses, but because she enjoyed the courses, she chose to take additional courses, which led her to an advanced education in chemistry. Even though her mandated curriculum only required two science courses, she became an accomplished scientist, yet *A Nation at Risk* called for an increase in the required science courses for all students to increase from two to three, and the state of Georgia has increased the graduation requirements from three sciences to four sciences over the last few years. According to Amy, many students are taking advanced science courses to meet a graduation requirement even though these students do not have any desire to take the advanced science courses.

The Era of Standards called for a *standardized curriculum* for all students. Therefore, all students would have the same exact coursework and knowledge, regardless of their personal interests or aptitudes. Amy discussed the concept of a standardized curriculum for all students. Students who take a course to meet a graduation requirement or to pass a test do not exhibit the aptitude or attitude to learn the required skills and concepts. In the following passage, Amy described one of the unintended outcomes of a *standardized curriculum.*

> You know forcing, forcing some of these students to take chemistry is not, is not going to solve our problem. If they have no interest and so forth, they would be better off in something else . . . I have seen more people being put into chemistry that probably would not have been. A lot of them I get and what we have, since we are on block scheduling we have math year-long supports, so they take a whole year to do the math. They are not used to moving as fast as I am. I think it is a struggle for some of them and they quit, because this is the first year they have started complaining, "Well, I am only in math support," and I say, "Well, I am sorry, I don't have year-long chemistry. We must move at this pace." So that may be a problem we are going to have to address pretty soon. Do we want to have

> a year-long chemistry if these students that are still going to be taking chemistry? (Interview, 11/30/12)

According to Amy, many of the school reforms and improvement strategies have been "recycled under a different name" (Interview, 11/30/12). One reform model that she spoke about specifically was the LFSs program that many local school systems implemented in the early 2000s. Amy said that she has continued to use many of the LFSs strategies because she thought that they helped her students learn difficult concepts. She continues to use strategies that she found to be beneficial to student learning, but she also discarded the strategies that she did not find to be valuable or beneficial to student learning.

Teaching Knowledge and Instructional Practices

Amy's education, work, and family experiences played a large role in making her the teacher that she is today. Her experiences in the field of chemistry have removed barriers that many chemistry teachers have teaching many of the complex concepts of chemistry. The following passage details the benefits that her education and experiences have made regarding her ability to teach chemistry.

> It's like my chemistry background has helped me set up some experiments and stuff that you might not find in the book, or help explain to another teacher why this works the way it works, and not having as many reservations about going and trying something new. (Interview, 11/16/12)

Over her career, Amy has made numerous decisions regarding her teaching methods and strategies. For example, while taking classes to obtain gifted certification, Amy attempted to use many of the teaching methods that she was shown during the classes. However, Amy maintains that she made the decision to use the prescribed strategies, and they were not mandated for her to use every day. The difference between choosing to use a teaching strategy and being forced to use a teaching strategy is perhaps

the greatest indicator of the persistence of the use of the new strategy. Amy continues to use many of the teaching strategies that she learned when her school system adopted the use of LFSs strategies. However, Amy maintains that she uses strategies that she finds beneficial, and not because they were mandated.

The Common Core Curriculum and the Next Generation Science Standards

As a result of the current reform mandates, experienced science teachers like Amy are continuously under scrutiny by their administrators to improve their instructional teaching practices and improve student learning outcomes. Currently, Amy must integrate and increase the use of the literacy tools and strategies with the implementation of the new CCSS for literacy. Amy has attended and engaged in professional learning opportunities to improve the implementation of the CCSS, and she says that the new CCSS standards may be beneficial for students in the future. However, although Amy sees the benefits of the new CCSS for students, she noted the difficulty that many teachers experience getting students to perform with regard to the new standards. In the following passage, Amy describes some of the measures that she has used to help in the implementation of the CCSS and the possible benefits of the CCSS in science education:

> A few of us met back in October to look at the literacy standards and start making examples. So I went through the 11th and 12th grade CCSS literacy standards and figured out that we were to increase science literacy and help students to read and process material. Well, any lab would fit that standard. Another one of the standards was to have them (the students) design one lab. Another standard was about writing an article. There are some places where we already perform these actions, and there are some times I do these things . . . The problem will be getting students to perform these actions. Then, yes, because this is kind of everyday life. I have to read instructions and process what's going on and I have to write. Students say, "This isn't English class. I don't have to write paragraphs." I told my students, "You know I went into science thinking I could get out of writing. Well, you don't get out of it. You know that is one of those things, you have to be able to write stuff. You have to be able to write, you

> have to be able to communicate, that's true of anything, of anything you decide to go into." I guess we get frustrated because we are hoping students are going for something better than "do you want fries with that?" You know, especially to take chemistry, you are thinking they are thinking to go above a minimum wage job to get certification in something . . . If the standards can be implemented and we can hold to those standards, then they will be beneficial. (Interview, 11/30/12)

When Amy reflects on the previous science reforms and the implementation of the NGSS that are being slowly unveiled over the next school year, several themes emerged. For example, Amy briefly acknowledged the Benchmarks for Science Literacy that were released in the mid-nineties. Interestingly, Amy said that she knew about them because of several professional learning activities, but the Benchmarks for Science Literacy did not affect her teaching methods or strategies very much at all. According to Amy, these standards were not assessed, and so she did not follow them. The Benchmarks for Science Literacy called for an increase in the use of inquiry-based science instruction. The following passage details Amy's use of *inquiry learning* to teach her science classes:

> I heard about it, looked at it and is it going to be truly inquiry based? I don't have time to wait on them to decide to figure out something. And so I said, it was not something I would try to incorporate. I'd heard about it. It would be nice to try, but it wasn't going to be anything that I would do every day. It might have one, two activities that I might use. It would probably be guided inquiry, where you lead them a little more and that would be more conducive to what I do or am doing now. I'll tell you, my AP class found some virtual labs on gas laws on the internet, so they are manipulating that and one of my students said, "This isn't changing." I said, "That's what you are supposed to notice, that if you kept this going, that wasn't supposed to change." So that's more guided in my mind, more guided inquiry where I didn't stand up there and tell them that, but I gave them this activity that said, you know, plot this data. What do you see? So I don't know if that is truly inquiry based, but to me it is a little more helpful if they can figure it out. It's a shift to let some of my students have time to figure out scientific concepts. (Interview, 11/30/12)

Since the publication of *A Nation at Risk* in 1983, the science graduation requirements for students have gradually increased from two courses in science to four courses in science during high school. The increase in graduation requirements has placed additional stress on students and teachers alike as students are now required to take more upper level science courses to graduate high school. The following passage illustrates Amy's opinion of the effect of the increased graduation requirements for all students.

> We all have our strengths. For some of my art students, is there any reason, artistically wise, to be able to do calculus? Why should they be able to do calculus? As I told mine, every once in a while it comes out of my mouth that you are a high school student. You should be able to do this by now, or you should be able to learn how to do this by now. Like I said, the painfully advanced stuff, like I said, not everybody should do advanced math. Not everybody should do advanced science. Some of us should not have to write the statistics. People are different for a reason. And to that point that you get to be a junior in high school, it is time to start branching to where you're going to. The one concept that is hard to do that we explored for a very, very short time was *High Schools That Work*. Everybody came out of there with some sort of certificate in a field that they chose. (Interview, 12/07/12)

The increase in graduation requirements has led to an increased number in students taking extra science courses, but the increase in students in these courses has not necessarily led to an improvement in science students. According to Amy, "As the number of science students have increased, the proportion of good students has decreased" (Interview, 12/07/12). In the following interview excerpt, Amy describes the situation that occurs when students enter her chemistry classroom without the true need for chemistry.

> So I guess we were looking at trends and that's one. They told the students they had to take the fourth year of science. I've got some people that do not quite have the skills for chemistry. Probably would not have taken it except for that reason. And we have some guidance counselors that insist

> that if you are going to college, you are supposed to take chemistry and that is not true. My husband will tell you, VSU does not require chemistry. You try not to get frustrated and you try, you know try to, try not to, try not to make them feel like they were stupid when they are not prepared for chemistry. (Interview, 12/07/12)

Summary

Amy's life has been filled with numerous experiences that have influenced her career and her belief systems. As an analytical chemist, she worked in environments that were either supportive or demeaning. If she had not moved with her husband when he accepted a university teaching position, she might not have ever entered the field of public education. However, as a highly-efficacious individual, she left private industry to begin her teaching career. As a teacher, she recognized and demonstrated her ability to move between schools to find better teaching situations when she transitioned from the small high school to the much larger high school.

Remarkably, as a teacher, Amy was able to avoid many of the problems because of her ability to document student behavior and force them to become accountable for their actions. However, it is easy to note that she gained the majority of her satisfaction, frustration, and disappointment from the interactions that she had with her students. Interestingly, she felt the greatest satisfaction from students whenever they would finally acknowledge the lessons that she taught them after they were gone from her classroom. The frustration and disappointment came almost daily, as Amy worked diligently to make her students work to learn difficult material when they seemingly did not care.

As a teacher, Amy faced many ups and downs, but all of these experiences made her a much stronger person. Amy speaks of her educational career with fondness, and she is getting ready to move into the next stage of her life. Conversations with Amy led

the researcher to believe that even though she has had a successful and long career, the daily responsibilities of teaching are beginning to wear her down. Amy will retire from teaching in Georgia in approximately 3 years, but she is unsure of the future. She does not feel as if she is old enough to just quit, but she does not know if she wants to continue in education.

Working as a teacher in rural south Georgia has allowed Amy to have many experiences and a fulfilling life. Amy, like many science teachers, did not enter the field of education for great riches, fame, or fortune, but has lived her life to the fullest. Her participation in this study provided for exceptional insights into the educational profession, and the beliefs of one of the most decorated and exceptional teachers living in south Georgia.

Chapter V

CASE STUDY: LAUREN

During the selection process for research participants, one individual came to mind before any other individuals. Lauren is the teacher who introduced me to science in high school. As my first high school science teacher, the activities, labs, field trips, and science content that she used provided the spark that would eventually propel me towards the teaching profession.

Beginnings

Our interview sessions took place at her home, which is located down a paved country road in rural south Georgia. The message describing the directions to her house provide insight into Lauren's nature, when Lauren writes, "go 3.8 miles" down a certain road because "we scientists like to be precise" (Personal message, 12/25/12). I noticed several items that help describe the rural nature of the interview setting. For example, when she provided directions to her house, she made a point to stress the location of the family boat that would provide an excellent reference point to identify her house. As a south Georgian, the researcher noticed a live animal trap located outside her house that helped eliminate a persistent problem with stray animals that might cause harm to the family pets. These simple items illustrate the dual nature of many educators living in the rural South. An analysis of Lauren's resume illustrates her extreme competence and ability in the area of science education, but her surroundings illustrate her background and childhood in south Georgia.

After working in education for a total of 40 years as a science teacher (30 years) and as a RESA science specialist (10 years), Lauren decided to completely retire so that she could spend more time with her husband and have time to travel. Coincidentally, the first interview took place on the day after Christmas, just after Lauren returned from a 2 week vacation to Hawaii. After many years working in the field of education, Lauren was able to take the trip of her life, and her tanned complexion and vibrant eyes provided evidence that showed that she has definitely enjoyed her time in complete retirement.

When she was first approached about participating in the study, Lauren enthusiastically agreed to the interview protocol and procedures. Lauren never hesitated to provide her resume or respond to any communications, and she worked diligently to schedule the interviews in a timely and consistent manner.

Education

Lauren's resume reveals numerous facts regarding her education and her decision to enter the teaching field. Lauren graduated as the valedictorian from the same high school in which she would eventually teach for 24 years. The year that she completed her bachelor's degree, Lauren received the Valdosta Rotary Club award for the highest cumulative grade point average for the graduating class of Valdosta State University (College) in the spring of 1972. Over the course of her career, Lauren would worked to obtain a Master's degree in Biology Education and ultimately an Educational Specialist Degree in Broad Field Science from Valdosta State University.

As the valedictorian of a small rural high school, Lauren had the opportunity to pursue any career that she wished, but she describes her decision to pursue education in the following passage.

> Well, in the 1960s, women didn't think about becoming doctors, lawyers that kind of thing. Some did, I guess, but I was engaged, and knew that I was going to get married. We would be settled in this area, and if I wanted to become a doctor, lawyer, whatever, I knew I would have to go away somewhere else to school. I couldn't go to school nearby. Augusta or Macon would be the nearest schools that I could attend if I wanted to do anything other than teaching and nursing, and I knew I wanted to teach rather than be a nurse. I always tutored students in high school, and I always thought that I would like to teach anyways. (Interview, 12/26/12)

Lauren's decision to teach science resulted from her success in and enjoyment of the subject matter. For example, as a freshman at in college, Lauren won the freshman Physics Award, and her passion for science carried on throughout her career as a lifelong learner in science. Even today, Lauren continues to read scientific journals to stay current with scientific content and educational trends.

Teaching Career

Lauren's career can be divided into two distinctly different eras. The first era of Lauren's career was her teaching career. According to Lauren's resume, she taught in two different school systems for a total of 30 years before she became a Science Specialist and School Improvement Specialist. She remained in this position for the final 10 years of her career before she finally retired in 2012.

Upon graduating from college, Lauren could have started teaching at the high school she attended, but she made the decision to commute to a different school for the first 6 years of her career. In the following passage, Lauren describes her decision to get her feet wet in a school system other than her alma mater.

> I started teaching right out of college in 1972 at a nearby high school. I taught all biology classes at that time. I taught there for 6 years because I really didn't want to teach at the high school from which I graduated. I wanted to go somewhere else and kind of make my way in the world. (Interview, 12/26/12)

Lauren commuted to the nearby high school for 6 years, but the decision to start a family eventually led her back to the local high school from which she had graduated. According to Lauren, the decision to change high schools was not because of dissatisfaction with her school, but was due to her growing family. Lauren portrays this situation in the following passage.

> When we decided to start a family, I thought that I probably needed to go back and teach where my children were going to attend school. Logistically it was better. So I had a job offer from my high school, and I started there. I spent the next 24 years there. I spent a total of 30 years as a classroom teacher at the high school level teaching all kinds of high school science, physics, physical science, biology, a little bit of math, year-book, and all kinds of other things you do as a high school teacher. (Interview, 12/26/12)

Lauren's career as a science teacher was filled with numerous awards and commendations for teaching excellence. According to her resume, Lauren received the local Teacher of the Year award in 1988 and 2001. Lauren was a semifinalist for the Georgia Teacher of the Year award in those years as well. In 1983, 1985, and 1996, Lauren was chosen as the STAR teacher for her high school. In 1996, she was chosen as the Sigma Xi Outstanding Science Teacher and the Tandy Technology Scholars Outstanding Science Teacher.

Science and School Improvement Specialist

After 30 years of successfully teaching high school science, Lauren stepped out of the classroom and into her new role as a Science and School Improvement Specialist. Due to her success in preparing students for the GHSGT, Lauren also began speaking to other schools about methods to improve student success on the GHSGT. According to Lauren's resume, she "gave presentations on raising science graduation test scores at the Coastal Plains RESA Science Consortium, the Southwest Georgia RESA Science

Consortium, the Georgia Association of Alternative Schools, Brooks County High School, Pelham High School, and finally the Georgia Science Teachers Association." As a National Board Certified teacher, Lauren was given the opportunity to speak to fellow teachers regarding the tedious application process and the benefits of obtaining National Board Certification.

Lauren's exploits into teacher development provided her with a strong platform for speaking to science teachers regarding school improvement. During her tenure at CPRESA, Lauren delivered professional development to teachers regarding Learning-Focused Schools, Leading Assessment, Meeting the Standards, Ruby Payne's *Framework for Understanding Poverty*, *Thinking Maps*, Instructional Coaching, Formative Assessment, Differentiation, the Statewide Longitudinal Data System, the Georgia Performance Standards in Science, the Common Core GPS, Classroom Instruction that Works, and finally Professional Learning Communities.

For 10 years after leaving the science classroom, Lauren worked to deliver professional learning opportunities to teachers across southern Georgia. Her expertise as a classroom teacher and school improvement specialist provided her with insight into the realities of teaching in today's classroom and many of the struggles of teachers. Lauren's primary reason for leaving the classroom to accept the position at RESA is outlined in the following passage.

> Basically my job was to teach teachers to work with teachers. My mission was to help teachers in any way I could, because teachers need a lot of help these days. They're overworked and underpaid. They needed all the help they could get, so that is what I did for ten years. (Interview, 12/26/2012)

The experiences and insights gained by Lauren during her years at RESA provide another lens from which to view the challenges of school reform and improvement for school teachers and instructional leaders. Lauren's willingness to empathize with classroom teachers and her understanding of the ever increasing demands of the teaching profession from both sides of the leadership spectrum provide additional insight into the content of her case study.

School Demographics

Even though Lauren's career can be divided into two distinct eras, it is important to understand the environment in which she spent the majority of her teaching career. Lauren taught for 24 years at a small high school located in southern Georgia. According to the Georgia DOE school report card, during the 2010 – 2011 school year, the school at which Lauren taught for 24 years had a total of 915 students. Demographically, the school was composed of 1% Asian students, 36% Black students, 8% Hispanic students, 52% White students, and 3% Mixed race students. The other demographic indicators by subgroups included 9% students with disabilities, 2% limited English proficiency, 61% eligible for Free/Reduced meals, and 1% migrant students. Lauren's experiences working in a small rural school are invaluable to the content of this dissertation.

Satisfaction and Disappointments

As a very successful student, Lauren decided to become a high school teacher because she felt that it was her calling. In the following passage, Lauren describes her motivation to become a school teacher.

> I always thought that I would like to teach. I just thought maybe that teaching was my calling and I think it was. I loved it! The teaching career has been good to me and it was very rewarding, not so much monetarily, but the retirement income is nice. (Interview, 12/26/2012)

After a long teaching career and opportunities to work that increased her retirement income, Lauren has finally been able to rest. However, Lauren describes many of the other incentives that she had to continue teaching besides monetary reasons. For example, Lauren describes many of the relationships that she was able to foster as a teacher with her students. According to her, one student once told her that she "was like another mother to her" (Interview, 12/26/2012). Another instance when Lauren felt rewarded for teaching involved a successful former student mentioning her name in a newspaper article regarding his success in the military and in life.

According to Lauren, much of her motivation for teaching did not involve monetary incentives, but rather the personal satisfaction of knowing that she had helped a student succeed in school and ultimately in life. In the following passage, Lauren describes several of the occasions when she realized that the time she spent teaching students worked to change their lives.

> I enjoy helping people. If I can do that, whether I am recognized for it or not, it gives me a warm fuzzy feeling inside. When people mention it and thank me for helping them succeed, you know; I still get notes and things like that. My former students will come up to me and hug me in the grocery store or department stores. They remember and those kinds of rewards are what make teaching worthwhile. (Interview, 12/26/2012)

According to Lauren, many of the rewards for teaching came much later than the day-to-day struggle of the classroom. However, there were some occasions when students grasped a difficult concept, or exhibited the "ah ha" moment that provided Lauren with the motivation to continue teaching. In the following passage, Lauren describes the feelings of satisfaction that she had whenever she helped a student to finally understand a concept.

> When students don't understand something and then, all of the sudden, they do understand it, that's very rewarding. I had a student once, who was just an average student, "C" level student, struggling in physical science when we learned how to write formulas and name compounds. She caught onto it quickly, but for some of my "A" students, the light bulb didn't come on immediately with them. So I asked her to help some of those students. I gave them a sheet where they had to do some of the problems. I said, "You are going to help them. You understand it. They don't understand my explanation so far, so maybe you can talk to them and they will understand how you think about this." She explained it and the students caught on and she was so proud. Her grades came up after that because she thought that she could do the work, and she was willing to try a little harder. So the light bulb came on in her and she got some recognition for the fact the light bulb had come on. Those little victories, the little things…add up a lot. (Interview, 12/26/2012)

For Lauren, the small victories that the classroom provided and the knowledge that she helped her students succeed in reaching their goals motivated her to continue teaching in the classroom for 30 years. Towards the end of her teaching career, Lauren began to notice the array of challenges that would face teachers in the wake of NCLB. Lauren's desire to help teachers become successful in the face of the challenges of the new standards and accountability measures led her to pursue the various opportunities at RESA.

Lauren, like many teachers, faced many disappointments over the course of her career. Lauren recalled the moments when students failed to work to their full potential and the frustrations of working with students who did not seem to care. In the following passage, Lauren describes her frustration working with students who did not want to learn.

> You develop key sayings that you can use with students that can maybe turn them around and there have been a few that no matter what I did, it, it just didn't work with them and that was a big disappointment. I couldn't save them all. (Interview, 12/26/2012)

Over the course of our interviews, Lauren's passion for her students became increasingly evident. As a teacher, Lauren was recognized for her *excellence* in the classroom and her ability to achieve good test results. However, she recalled the amount of discouragement that she felt when she could not reach some students. In the following passage, Lauren recalled a conversation that she had with a fellow teacher regarding one of her difficult students.

> And I remember another teacher. I was talking with her one day and said, "You know, you seem to have a good relationship with this student. Tell me what you do because I'm not making any headway with this particular student." This teacher told me, "He is a problem in my class too, but my husband told me one time that even Jesus Christ couldn't save them all. So what makes you think that you can?" This other teacher continued to ask me, "What makes you think you can save them all? You just can't." I told her in reply, "Yeah, but we are going to keep trying though aren't we? We are not going to give up on them. We are going to keep trying to save them all." (Interview, 12/26/2013)

Overwhelmed

As a teacher, there were numerous times in her career that Lauren felt overwhelmed by the stresses of the classroom and her additional duties that came with teaching and having a family. There were times during her career when Lauren contemplated whether or not she was supposed to continue in the field of education or if she should pursue another career. The following passage exemplifies her struggles with the choice of education as a career.

> I don't know if I was still learning to teach at the time or if I was really doing a good job. I began to think, "Well, have I made the right choice?" You know this job is just so tiring, so exhausting. And there is always something to do and in high school there were always extra-curricular things to do. With young children, I was not sure that I wanted to teach for 30 years. (Interview, 12/26/2013)

As a teacher, Lauren believed that she had control of the things that took place within her classroom. Lauren believed that she could shut the doors to her classroom and enter into her own realm, devoid of the outside events. However, she also spoke of the importance of a supportive administration for classroom teachers. If classroom teachers are provided with administrative support regarding discipline and instructional matters, then teachers are more successful. The following passage helps illustrate Lauren's perception of the effect that an administration may have on their staff regarding school policies.

> There was one time I had a very bad principal. For the most part, I was blessed with very good and supportive principals. They were not supportive of just me, but all of the teachers. Then I had a bad principal that made a teacher cry one day. She did nothing wrong, and he made her cry. I just thought nobody should ever make this sweet teacher who works so hard and she is so brilliant cry. I thought, "We are going to lose her because of this." And we did. She quit! She quit! She got out of teaching because of it. That kind of thing just really disheartened me. That somebody like that could move up to the level of administrator and then have such a bad impact on teachers. Teachers need to have their morale boosted, and he was tearing everybody's morale down. (Interview, 12/26/2013)

As a science support specialist, Lauren used the lessons that she learned in the classroom to work with science teachers in her district. When Lauren performed classroom observations, she made a concerted effort to look for positive things that teachers were doing in order to build up teacher morale and self-esteem. In general, Lauren believes that teachers should be provided with the necessary support if they are going to become successful.

Teacher Support and Empowerment

For the vast majority of Lauren's teaching career, she believed that she had the support of her administration to teach in ways that she wanted. However, there were a

few instances where a lack of support affected her ability to teach successfully. Sarason (1996) and Ingersoll (2002, 2003a, 2003b) express the importance of teacher support and empowerment within a school setting in having the greatest positive impact on a school. Throughout our interviews, Lauren provided numerous instances and recollections of experiences that support the assertions made by Sarason (1996) and Ingersoll (2002, 2003a, 2003b). For example, Lauren described some of the interactions that she had with one of her administrators in the following passage.

> For the most part, I felt empowered, but I felt as a whole, that most teachers were not. I thought that it was important, and I made that statement several times to this principal who wasn't such a good principal. He wanted to argue with me about it, but for the most part I felt empowered for much of my career. I worked for some good administrators. They didn't always give me what I asked for but they would explain why and they would listen. There was only one time that I asked to do something, and I was denied. I never really understood why except it was a power thing I think, where the principal said, "I'm principal, and I just decided!" (Interview, 12/26/2013)

According to Lauren, the relationship between an administration and his/her staff should be one of mutual respect and trust. Teachers should be able to approach their administration with problems and concerns, and the administration should provide their teachers the opportunity to contribute to the decision making processes within a school. In the following passage, Lauren describes her beliefs regarding the relationship between the administration and the teachers within a school:

> Teachers need to be treated like the professionals that they are. They need support from the administration. I have seen some cases where administrators would take the version of events that a student gave them and believe him / her without even asking the teacher for his /her version of the events. That is just wrong! That is where you lose some very good teachers. (Interview, 12/26, 2013)

Lauren's experiences in the classroom, and her experiences as a science specialist shaped her opinions regarding the teaching profession. On numerous occasions, Lauren referred to the importance of teacher morale and the lack of respect and support that many teachers receive from their administrations. The following passage further illustrates Lauren's understanding of the pressures that teachers feel regarding their profession.

> I worked with teachers, and they would talk to me. They felt a great deal of pressure, and you can read in the newspapers about teachers all over the state as well as administrators that that pressure has forced them to cheat (on tests). Of course, that is not good, but I am not saying that that is totally the fault of pressure. People should never cheat under any circumstances, but they would not have cheated had they not have felt that pressure. It is lowering teacher morale. Many teachers that probably would have taught a few more years are retiring now because of that. Some teachers are even retiring before the full 30 years. They are taking the penalty and retiring if they have enough to go ahead and earn a little bit of retirement income. (Interview, 12/26/2012)

Even though Lauren believes that she was supported throughout the majority of her teaching career, during the final years in the classroom, the level of support decreased dramatically with a change in her administration. According to Lauren, the decreased level of support helped her make the decision to leave the classroom. In the following passage, Lauren describes the thought process that she had while leaving the classroom.

> The last year that I taught, I had an administrator for whom I had no respect, so I was ready to get out of the classroom for that reason. I didn't know how much longer that administrator would be there. He didn't last much longer, thank goodness, but the discipline! I had some students that were discipline problems, and I didn't feel that we, as a whole, not just me, but teachers as a whole, were getting the support that we needed from parents or administrators to help us deal with those. I was to the age that I didn't have the energy, and I didn't think that I could continue doing it much longer. You know, it was not a health issue or anything, but just teaching high school; all the extracurricular things that you do, they were just overwhelming. (Interview, 1/05/2013)

As a highly decorated teacher, Lauren was able to move into a position as a consultant with RESA after 30 years in the classroom. However, the amount of stress and decreased morale that she observed while working as a consultant led her to come to the conclusion that if she were entering college now, she would *not* enter into the field of education because the rewards do not outweigh the things that she would have to endure as a teacher today. In the following passage, Lauren describes the things that she thinks would have to change for teachers to survive in the classroom for an extended time.

> I don't think it's impossible, but I think there needs to be some changes that are more supportive of teachers. I think teachers have gotten a bad rap in the media. They're being blamed, and like I said, the really conscientious teachers who are trying to do a good job, those are the ones that are getting very frustrated with all of that. Those that really don't care are not going to correlate their objectives to the lesson plans anyway. You know they might turn in some lesson plans if they had to. Yes, I at this point, I would not recommend that one of my sons become a teacher. Teaching was good for me. I got into it at the right time and while I didn't have a lot of mentoring or anything, I did feel supported and valued and I'm not so sure that teachers, from what they tell me these days, I don't know that they feel supported and valued. (Interview, 1/05/2013)

Lauren described many of the changes that took place throughout her teaching career regarding the introduction of standards, standardized testing, and accountability. According to Lauren, as a good teacher, the numerous changes and reforms began to add up over the course of her career, but a supportive and understanding administration is extremely important for the success of teachers.

Academic Standards

Over the course of her career, the introduction of standards had very little impact on her teaching methods and strategies. As an extremely successful teacher, Lauren taught science concepts and principles that she believed would benefit her students at the

next level of their education. In the following passage, Lauren describes her introduction to the QCCs.

> I don't remember exactly when the QCCs were put in our mailboxes, but I do know for a while we just thought somebody at the state department was saying that this was what we needed to be teaching. They had no impact until a few years later. I can't tell you what year that we started putting them in our lesson plans because our administrators told us to. (Interview, 1/05/2013)

According to Lauren, throughout her career, she never turned her lesson plans in to her administrators, but her administrators wanted them to be available if she were observed. However, the QCCs were supposed to be included in the school-wide curriculum guides that were rarely used by all teachers. According to Lauren, "For the most part, curriculum guides were done because they were required and then put on a shelf. I think some teachers used them, but I think the majority of the teachers didn't use them regularly" (Interview, 1/05/2013).

When the GHSGT was introduced, Lauren says that she tried to teach using the QCCs to help guide her instruction, but the vast majority of standards made it extremely difficult to cover all of the required material to help her students succeed on the test. According to Lauren, the most effective way to help students succeed on the GHSGT was to align her teaching and curriculum to the state testing objectives.

Testing, Accountability, and Student Apathy

Once the GHSGT was introduced, teachers gradually left the Era of Standards and entered the Era of Accountability. Once the state released the testing objectives, Lauren began to align much of her curriculum to the testing objectives to help ensure that her students would be successful on the GHSGT. The following passage outlines the process that Lauren followed to help her school become successful on the GHSGT.

> I think the most effective standards for the graduation test were the test objectives. The states sent us those for the science department graduation test. When it was implemented, these were the objectives on the test, so we knew this was what was going to be tested. When I started teaching the course, that was remediation for those who had failed the science part of the graduation test and then it developed into a prep course for students who were at risk for failing it before they ever took it as juniors. We just had this course that was for both groups, and I used those objectives. I handed them to the students. I said, "This is what you have to know for the test." These are the objectives that I used to develop practice questions, because there were no practice questions at that time. ABC Book Company had not, at that time, even prepared any guides for the graduation test. So all of my lesson plans and everything focused on the testable objectives, not from the QCCs, but they were much more beneficial at preparing students for the tests than the QCCs. (Interview, 1/05/2013)

The introduction of the GPS and the EOCT narrowed the curriculum for science teachers. Instead of using the standards to justify classroom activities, teachers taught the GPS because they knew that their students would be tested over the specific objectives. According to Lauren, “Teachers could use the GPS to guide their instruction, because the GPS did as well as the GHSGT content descriptors” (Interview, 1/05/2013).

During the transfer from the Era of Standards to the Era of Accountability the amount of individual responsibility for student achievement gradually changed. At the beginning of the Era of Standards, students were required to learn course material to pass a teacher’s course. During this time, much of the responsibility was placed on the students to learn the class material. When the GHSGT became a requirement for graduation, the school was held responsible for increasing the number of students who passed the test, and both the students and teachers felt some responsibility to achieve success on the GHSGT because both parties had stakes involved. However, when teachers became associated with a pass or fail rate on the EOCT, regardless of the quality, effort, or level of apathy of the students, then the amount of accountability

drastically shifted from the students to the teachers. In the following passage, Lauren tells a story that helped to illustrate the level of frustration that many teachers felt with regards to standardized testing and accountability.

> A man who was very wealthy had made all his money making ice cream. One of the flavors that his company was famous for was blueberry ice cream. He was giving a speech to teachers about how we needed to improve education and this little old teacher stood up at the end of his speech when he was taking questions. She asked him how he selected the blueberries for his ice cream and he said, "Oh, we only select the very best berries and we breed the plants and all, and he went on to how they could pick the very best, so that they could make the very best blue-berry ice cream." She told him, "We don't get to pick which blueberries come into our classroom. We don't get to pick the students that come into our classroom. We take all that come, and we do the best that we can with those. So you can't compare what you've done in business with what we do in education." That's what we're doing in education today; we're trying to make it fit a business model, and I must say that some of those efforts have resulted in some good things. But it's like everything else. You have to take it in moderation, and common sense has to come into play at some point. So you see that one size doesn't fit all, and every child is not going to be prepared for college. (Interview, 1/05/2013)

Student Learning and Teaching Methods

Lauren, like many teachers, holds the belief that she can teach any student who is willing to put forth the amount of work to be successful. Over the course of her career, Lauren picked up new methods and strategies to help her students become successful with rigorous course work. In the following passage, Lauren describes her evolution from a new teacher to a statewide Teacher-of-the-Year candidate.

> Some of my methods came from how I was taught, but over the years I think I developed my own style. I had some wonderful teachers in high school and a few good ones in college after which I modeled some of my teaching, but at that time, it was mostly lecture, and when I first started teaching, that was my main teaching method. I moved away from lecturing. My classes did more hands on, more labs, and I wouldn't just put a video tape in or later years a DVD, but I wouldn't put that on and just have students sit and watch it. We were doing something with the

> material. My classes were more interactive, and of course, began to use computers a little bit towards the end of my career. (Interview, 1/05/2013)

According to Lauren, her primary method for teaching evolved from lecture to a more inquiry-based approach. According to Lauren, science content does not always lend itself to a particular framework or model for instruction. In the following passage, Lauren describes a typical lesson in her classroom.

> I would have an opening activity to get the attention of my students and get them to think. I would try to get them to figure out something that is easy in science. One example, I had a little toy that I bought called the drinking bird. You put a beaker of water in front of it, and as long as his head is wet, he'll constantly dip into the water. So I had that on the demonstration counter when students came into class one day, and I asked them to explain what was happening in writing. My students had to write it out and not just tell me. They had to write what they were observing and why they thought that was happening. I would gradually give them hints. I would have a student come up and feel the head of the bird after a while when they were kind of stumped, and I would let them feel that the head was wet and give them that piece of information and let them think a little more. That's the way I would open a lesson with something that would catch their interest. Doing this would get them to think and offer explanations, and then I would give them some pieces of information about the topic. I might lecture a little bit, but it was more of a lecture-discussion. I would make sure that not only the students that volunteered got to talk, but I also some that would never volunteer. I could have some kind of hands-on activity for them, a lab or something, that dealt with the same topic. Sometimes students had some questions to answer. Students had to write their answers to be sure every student understood by the end of class. (Interview, 1/05/2013)

Lauren attempted to follow the same instructional model for most of her lessons. However, she noted that some scientific topics did not lend themselves for instruction following the model. According to Lauren, teachers should be allowed to use methods that are conducive to learning difficult material. As a RESA specialist, Lauren was often asked to conduct professional learning regarding an instructional framework that called for a prescribed opening, work session, and closing for every lesson. In the following

passage, Lauren describes her beliefs regarding the instructional framework and science instruction.

> Every lesson doesn't fit into the model. Some things can't be taught through a lab. For example, you can't teach nuclear fusion through a lab. You have to learn how it works from a book and from lecture. You can model nuclear fusion, but everything doesn't fit the model. There's just not enough time for students to discover everything. (Interview, 1/05/2013)

One concept that Lauren continued to stress is the freedom for science teachers to choose the methods that work within their classroom. According to Lauren, science teachers know effective methods to teach their content, but professional learning should be used to give science teachers additional tools for instruction. Many teachers will not incorporate teaching methods with fidelity if they disagree, or do not believe in the effectiveness of the teaching methods. In the following passage, Lauren describes the National Board Certification process as the catalyst for her greatest change in instructional methods.

> The thing that changed my teaching the most, and the fastest, was National Board Certification. During that process, I learned so much. It's supposed to be like a test, and I guess you've got to prove that you have the qualities to get National Board Certification, but I had a lot to learn. I didn't realize how far behind I was because I completed my six year degree in '92 and I had not gone back except for some staff development that interested me. I chose what I wanted to do. That was the big thing that changed my teaching and prepared me to work at RESA. I was teaching other teachers at the time that the GPS came out, and the instructional framework fit right in with the National Board standards that I learned about, but I had to learn about them on my own, and, of course, I always joined my professional organizations like the Georgia Science Teachers Association and the National Science Teachers Association. I would get some good professional learning material from them, but again I had to dig it out for myself. (Interview, 1/05/2013)

As a teacher, Lauren did not receive much professional learning from her administration. Because of her desire to be a successful teacher, Lauren would often pay

for her own professional learning opportunities. Even though Lauren did not receive much support in her professional learning endeavors, she did not have to withstand much scrutiny regarding her instructional strategies either.

School Reforms and Improvement

Over the course of Lauren's career, she was able to experience many different forms of school change and reform. Lauren described the limited effect of the QCCs on science instruction in her classroom, and according to Lauren, the implementation of the GHSGT and the release of testing objectives changed the content that she taught more than anything. The publication of the Benchmarks for Science Literacy did not change Lauren's teaching methods either, but rather her decision to receive her National Board Certification and the subsequent process to achieve National Board Certification made her become aware of the Benchmarks for Science Literacy.

One major school reform initiative that Lauren experienced was the change from a traditional 6-period day to block scheduling. During this change, Lauren went from teaching five classes for a complete school year to teaching three classes for one-half of the school year. According to Lauren, the change from a traditional schedule to block scheduling was perhaps one of her best experiences with school reform and improvement. In the following passage, Lauren describes the process that took place during this rather difficult transition process from a traditional schedule to block scheduling.

> One of the best things that happened at my school was when we moved to block scheduling. The administration set up the committees. We had one committee that was going to work on curriculum and anything that needed to be changed as far as curriculum was changed. I was on that committee because that's what I wanted to work on, but we made decisions about how many units students needed to graduate on the new block schedule.

> We had another committee that was just discipline and they rewrote the handbook for discipline, and how tardiness was going to be handled. Teachers knew what needed to be fixed. Teachers also knew that if you get students to school, we can teach them. Attendance was a real problem, and this was before attendance was a part of AYP. The attendance at my school was not very good at all, so we put a process in place. The rules for absences were developed, and if students missed too many days then our attendance clerks sent a letter home and then their parents were called. If students missed more than five unexcused absences, then they didn't get credit for the course unless there were extenuating circumstances. A panel of teachers would be on a panel and the parent and the child would come and explain why they had missed more than five classes. We could grant credit if their explanation was good. It really reduced the number of kids that just lay out of school and the grades improved . . . This was the purest form of teacher empowerment. Our principal was going through a difficult time, and she said, "You committees make the decisions. You're in the classroom area everyday, so you decide how you want to do all of this stuff." So we did, and I thought those were the most productive years. We were cracking down on attendance and getting students prepared for tests better than we ever had before. That is what I think should happen in all schools. Teachers should be empowered to make some of those decisions, and the administration should follow up on the decisions. (Interview, 1/12/2013)

Lauren made the transition to RESA before many of the accountability pieces associated with NCLB were implemented. However, her experience with helping students prepare for the GHSGT helped her facilitate the transition to the GPS for many teachers and school systems. Regarding many of the changes that took place in after Lauren left the classroom, it is interesting to note a couple of her opinions. As a RESA specialist, Lauren was known to "take off her RESA hat" regarding several school policies and decisions. During these moments, teachers would be willing to accept many of tidbits of wisdom that Lauren conveyed to the teachers. Because of Lauren's experiences and accolades in the classroom, many teachers would trust the advice and recommendations that she would provide.

The Common Core and the Next Generation Science Standards

Even though Lauren retired at the conclusion of the 2012 school year, Lauren was forming an opinion on many of the upcoming school reform movements and trends. For example, Lauren believes that the introduction of the CCSS in literacy and math will have a positive impact on student achievement in the future. According to Lauren, if teachers are able to teach students to be successful with these standards, then they should be successful in the science classroom. Another science education reform that is on the horizon is the introduction of the NGSS. Before Lauren retired, she was able to review a draft of the standards, and she made the following statements regarding many of the changes that she perceives regarding science education in the future.

> I think we are beginning to see an increased emphasis on math and science as we're competing with countries that are scoring so much better than the United States on international standardized tests. We're seeing more talk, and I hope that the talk will be followed by more funding for science and math. It's kind of a roller coaster. After Sputnik, we saw more interest in math and science and more funding. We're seeing more emphasis on science. The fact that science was to be a second indicator under AYP is another indication of the increased emphasis. It's another trend or cycle that we're seeing. I would like to say the pendulum is swinging from one side to the other, like student accountability to teacher accountability. If we could hit everything in moderation, and if we could get the legislators to keep their noses out of everything, and if we could keep them from micro-managing through all their laws, then we might be able to reach that moderation, but every President has an agenda, every Governor has an agenda, all the legislators have their things that they believe in and they want to do. It changes from one administration to the other, one state school superintendent to another. (Interview, 1/12/2013)

The NGSS has the potential for guiding science education in the future, but it is dependent on the implementation policies that accompany the new standards. Lauren acknowledged the importance of a school's administration in the implementation of any school reforms. According to Lauren, a school's morale is based on the level of support

that an administration provides teachers regarding the implementation process. If the administration is supportive and entrusts his/her teachers with making decisions regarding their practices, then the standards will be implemented. In the following passage, Lauren describes the importance of a school's administration in directing the actions of the school.

> All teachers have a college degree. They don't give those out to dummies, so they should be treated as the professionals they are by virtue of having that college degree and the sense to complete college with the degree in education. They need to be treated as professionals . . . Science teachers are telling me that they can't wait until they get their 30 years in, so that they can retire, or reach age 60 so they can retire, and some of the young ones are planning to get out and not even try to go 30 years. I think that the pendulum has got to swing in the other direction so that we're supporting teachers instead of beating them down all the time. (Interview, 1/12/2013)

Summary

Lauren chose to enter the field of education because it would allow her to live close to her childhood home and because it was a respectable profession in a small rural town. After working for 40 years in education, Lauren was able to retire and begin her life without lesson plans and accountability. Throughout Lauren's 40 years in education, she was able to experience numerous changes and school reforms. Like many teachers, she did not know of the policies that directly affected her work-life because her administration oftentimes shielded her from the policy changes. However, the influence of the school administration on teacher satisfaction and success is evident in Lauren's case study.

Lauren described the importance of her administration in giving the teachers the ability to make decisions. According to Lauren, the years that she was involved in the conversion of a school from a traditional schedule to block scheduling allowed her to

experience true empowerment as a teacher. The ability to work with fellow teachers to make school-wide decisions made her want to work harder.

Lauren's experiences with administrators were not always positive. As a teacher, she coped with administrators who did not support her decisions or other teacher's decisions in the classroom. She feels that an administrator's decision to not support his/her teachers demeans teachers and ultimately leads to a reduction in teacher morale. According to Lauren, the strong school administration is imperative for school improvement to occur.

Chapter VI

CASE STUDY: ELIZABETH

During the selection process for research participants, Elizabeth was chosen because of the length of her career in the classroom and her current position as an instructional leader in her school. Elizabeth is no longer a teacher, but her influence in the lives of students continues in her position as an instructional leader.

Beginnings

Elizabeth might have been the most difficult to interview because of her frantic schedule and her seemingly endless responsibilities. Our interviews took place at her school, where she seemingly had the ability to move about in any manner that she pleased. As an instructional leader, Elizabeth knows and understands the workings of her school and staff. Even though Elizabeth wanted to participate in the study, it was often difficult to get her to slow down long enough for a complete interview. For example, upon my arrival for our first interview, I ended up helping her sort student assessments for almost an hour after school. According to Elizabeth, "It was just another job that needed to be done" (Interview, 1/10/2013). Interestingly, before the second interview, I ended up helping her move equipment before we could begin.

Through numerous interactions and situations, it became evident that Elizabeth is an extremely hard worker who values the benefits of an education. Even though she is no longer in the classroom, Elizabeth believes that she can have a greater impact on student achievement by helping other teachers rather than teaching just her students.

Education

According to Elizabeth, she was always a good student in her science courses. As a high school student, her teachers provided her with opportunities to serve as a "lab helper" to help set up labs, and she tutored other students. While in college, Elizabeth worked as a lab assistant who helped set up labs for the professors and provided tutoring to other students as well. In the following passage, Elizabeth describes her early involvement with science and her enjoyment of the subject matter.

> I was always involved with sciences. The sciences were my love, and I was the lab helper in high school. When I was in college, I was always assisting in the lab. I had a lab job during the time I was in school, setting up labs for the professors, and if anybody needed any extra help, I would go in and help or set up, and be in there when they were doing their labs and explain what I was allowed to explain to them, not telling the answers. So I've always had kind of like a background in it but not looking at it as a career. (Interview, 1/10/2013)

According to Elizabeth's resume, she completed her Bachelor's degree in Biology in 1981, and she did not return to graduate school until 2004. However, Elizabeth collaborated with a Valdosta State University professor for 15 years to develop and deliver summer workshops to increase the implementation of inquiry-based teaching strategies in south Georgia.

Teaching Career

Elizabeth's career in education happened almost by accident. In the beginning, Elizabeth had a desire to work in the field of medicine, but through circumstances outside of her control, she was offered a position teaching science at her local high school. While working at her hometown hospital, Elizabeth received a phone call on a Monday morning after working a tough extended weekend in the hospital as a respiratory therapist's

apprentice. In the following passage, Elizabeth describes the circumstances surrounding her decision to become a teacher.

> I worked the whole weekend and on Monday morning, when I was supposed to go to sleep, I got a phone call asking me if I was still interested in teaching at the high school. I filled out an application to work as a substitute teacher. They were interested in knowing if I wanted to become a full time teacher. I went and interviewed, and they hired me. I started the day after Labor Day. (Interview, 1/10/2013)

Elizabeth taught for a total of 27 years. According to Elizabeth, she would have continued teaching, but she was given the opportunity to work as an instructional coach within her school district. In the following passage, Elizabeth describes her decision to leave the classroom to take on her new position as an instructional coach.

> When I left the classroom, it was not because I wanted to quit teaching. I was asked to come here because they knew that I knew the curriculum. The person in my position was retiring, and they wanted somebody who was going to replace her that was strong in curriculum. I went through the process of unpacking the standards, and I knew what the standards required. I knew the concepts of a standards based classroom, and I was new to the school. So I was not like one of their friends trying to tell them what they were going to do and what they are not going to do. So the superintendent came to me, and asked me to take this job. I debated moving, and I wound up in the hospital the last day of school because of appendicitis. I still had not officially told the superintendent that I was going to accept the position, nor had I told my principal that I was leaving. I became physically ill, and the next morning my principal told us that nobody could be absent from graduation. I drove myself to graduation and I had to call another teacher on the phone because I could not even get out of my car. I wound up in the hospital for four days because my appendix almost burst, so it was not because I wanted to quit teaching, I changed positions because I wanted to positively impact more students. (Interview, 1/10/2013)

School Demographics

Elizabeth has worked in the same school district for the entire 32 years of her career. Elizabeth taught at a small rural high school in southern Georgia. According to the Georgia DOE school report card, during the 2010 – 2011 school year, the school that

Elizabeth taught at had a total of 640 students. Demographically, the school was composed of 1% Asian students, 54% Black students, 7% Hispanic students, 37% White students, and 2% Mixed race students. The other demographic indicators by subgroups included 10% students with disabilities, 2% limited English proficiency, 77% eligible for Free/Reduced meals, and 1% migrant students. Elizabeth's experience working with predominately economically disadvantaged minority students is invaluable to the content of this dissertation.

Satisfaction and Disappointments

Elizabeth did not choose to enter education because she felt it was a *calling* for her. Elizabeth was sustained by the knowledge that many of the lessons that she taught her students would allow them to become successful in the future. In the following passage, Elizabeth describes some of the instances that motivated her to keep teaching, even when the career became more difficult.

> Sometimes a light bulb comes on for some students. That is when they finally understand what's going on. When somebody is given this terminology and they don't really grasp it, but then you give them labs, or you explain it a certain way, or you show a demonstration and the kid actually says, "Well, that's why this happens, or this is how it happens, or that's the way it works, or I always wondered why something would happen." Those kinds of ah-hah moments, they keep you coming back. (Interview, 1/10/2013)

According to Elizabeth, most of her motivation to continue teaching was not always instantaneous. Most of her satisfaction came from the fact that she knew that she did her job well. However, some of her students would return to school, after going to college, and they would thank her for many of the lessons and experiences that she gave them within her science classroom. In the following passage, Elizabeth describes the feelings that she has when students remind her of the things that she has done for them.

> Some students come back and tell you that they were glad that they had you as a teacher. You were tough, but you know the things that they had to do when they were in school prepared them for college, that it wasn't one of those classes that you just went in and goofed off. They weren't challenged enough in a lot of the classes that they took, and their science classes challenged them to think. (Interview, 1/10/2013)

According to Elizabeth, teaching in a school with a high proportion of impoverished students can be difficult. However, Elizabeth felt as if many of the relationships that she had with her students were important to sustain both her and her students. In the following passage, Elizabeth describes some of the things that she did for her students that could not be measured by a standardized test.

> A lot of it was personal. A lot of it was the fact that the students could come and talk to me. They felt like I was their second mom, or some of them didn't have a mom. Some of them had broken homes, and they had stepfathers or stepmothers that they weren't getting along with. Some of them had changes in their lives that they felt like they couldn't discuss with anybody else. I actually ran my own peer group, and mine was about self-esteem. So we would have pull out, and we would talk to the students about self-esteem. We talked about what took it (self-esteem) away, and what added to it (self-esteem). We worked for a year on the students that we felt like had bad self-esteem. (Interview, 1/10/2013)

Much of Elizabeth's satisfaction came from working with her students and her ability to teach her students about the world through science. According to Elizabeth, she continued to teach her students through the hands-on science activities until she left the classroom in 2009. As a science teacher, Elizabeth believed that science classes should be enjoyable to her students. However, over the last few years of her teaching career, Elizabeth began to observe a distinct shift in the focus of science instruction. The shift in focus led to many of Elizabeth's disappointments in teaching.

Elizabeth loves teaching science concepts to students, and she believes in using inquiry-based methods to improve student understanding of science concepts. Over the

last few years of her teaching career, Elizabeth noticed the emphasis changing from learning about the processes of science towards teaching specific content. In the following passage, Elizabeth describes her decision to continue teaching science in a manner that aligned to her personal beliefs rather than teaching towards a test.

> When I first started teaching, there were basic standards or objectives that I had to teach. There seemed to be more freedom for teachers to do what they felt like get a point across, but now it seems regimented. Towards the end of my teaching career, it was more regimented and teaching is scripted to the point where it takes the fun out of science. To me, science is fun. My disappointments came when kids didn't enjoy the science as much as I did. I thought everybody was supposed to like science. It wasn't that way anymore. (Interview, 1/10/2013)

Elizabeth's passion for science content and the process of learning science through inquiry-based lessons is evident in everything that she says. She expressed her frustration with the current nature of science education and many of her experiences trying to teach students who did not have the same passion for science. In the following passage, Elizabeth describes the process of teaching students who are not motivated to learn.

> Have you ever tried to force feed something? Do you know what it felt like when you tried to teach science and the kids didn't want to learn it? It is just like a baby that does not want to eat spinach. They are not going to eat spinach. They are going to spit it out at you, all over you. The same thing happens with science. (Interview, 1/10/2013)

As a teacher who was able to teach for 27 years, Elizabeth developed numerous methods to help her cope with the disappointments and frustrations of the classroom. Elizabeth was able to find enjoyment and fulfillment in teaching by being able to close her door to many of the outside pressures and delving deeper into teaching her content. Elizabeth was able to spend many of her summers preparing and redelivering professional learning workshops for other teachers, and these activities allowed her to

renew her love of science every year. In the following passage, Elizabeth describes some of the things that she would do in order to find refuge from many of the pressures of teaching.

> You have to be a self-motivator to go back into the classroom every day. When it becomes frustrating, you have to decide that it is okay to shut your door and teach science. You have to do summer workshops, work with the college, and get inspiration from sharing science techniques with other people. I think that was my life saver. I was able to go to different school settings and teach elementary teachers how to teach science so that students would be interested in science when they got to high school. I believe that that's where I got my batteries recharged. I worked with teachers who had little knowledge about doing labs and incorporating science into reading lessons. You know you did a good job teaching science by getting students to want to become science teachers or go into other science fields. When you have kids wanting to become involved with science, you know that you have been a positive inspiration, and you helped them along. (Interview, 1/10/2013)

Even though Elizabeth was able to teach successfully for 27 years, she has observed many teachers becoming overwhelmed by the need to document and record every single action that they perform. As a teacher, Elizabeth worked to create a peer group to help students become successful because she felt that she could help these students. The current requirements to document every action to provide evidence that teachers are performing their jobs correctly has led to many teachers feeling overwhelmed and underappreciated.

Overwhelmed

Even though Elizabeth stepped out of the classroom in 2009, she has observed a gradual increase in required documentation to provide evidence of teachers performing their jobs. According to Elizabeth, the number of things required for teachers to be successful has increased exponentially over the last few years. With the increasing number of requirements, teachers do not have the necessary time and resources to meet

the ever increasing demands. In the following passage, Elizabeth describes the overwhelmed feelings that many teachers have with the demands of their jobs.

> There is not enough time to do all the things that I want to do. It becomes overwhelming when there is so much paperwork in comparison to being actually able to teach. Many times we lose the interest because you are inundated with papers that have to go to three or four different people. I feel like we just spend too much time doing paperwork to document the things that we do. . . Right now that's where everything is, it's changed so much. I hear new teachers saying every day, "I don't have enough time to do everything that I'm supposed to do." I do not know where we've gone wrong. I think that our society has created a monster. I know when I was in school, I had an hour for each class that I took. I know that those teachers worked hard, and they graded my papers just like they graded all of the other papers. Teachers went from having 180 students down to having four classes of 20 students. We have all of these new acronyms, and we are trying hard to keep ourselves out of courtrooms. We have lost sight of what teaching is supposed to be. We are scared that we are going to not do enough RTI, and that we're not going to make enough notifications to people of the situations that our children have. It is a fact that we cannot get rid of spending so much time documenting the things that we are doing to help students. Our classrooms have become frantic because we feel like there are paperwork things to do to make sure that we document, document, document everything that we do. (Interview, 1/10/2013)

Throughout her career, Elizabeth was able to implement numerous programs to help her students succeed in the classroom and ultimately in life. However, over the last few years programs such as Response to Intervention (RTI) have dramatically increased the amount of paperwork required of teachers. According to Elizabeth, teachers are required to document everything that they do in order to provide evidence for their personal evaluations. Teachers are also threatened by the possibility of lawsuits if they are unable to comply with the paperwork requirements of their jobs. Essentially, teachers lose the ability to teach effectively because of the level of documentation required for everything that they do.

Teacher Support and Empowerment

As a teacher, Elizabeth felt that she was supported by her principals for the majority of her career. Because Elizabeth worked in the same school system for her entire career, she has had a limited number of administrators. However, Elizabeth believes that a school's administration has the ability to define a school's culture through their ability to support and empower teachers. In the following passage, Elizabeth describes her experiences with one administrator who believed that all decisions should be controlled by the administration, and if a teacher showed initiative without asking for approval, they were swiftly reprimanded.

> One time I asked the high school football coach to speak to a group of disruptive boys. The principal called me in into his office and he said, "I see that there is a visitor in here." I replied, "Yes sir." He quickly told me, "Nothing happens in my building unless I gave permission for it to happen." He was pretty much telling me that I had to run everything through him before I made any decisions. Even though it was a fifteen minute talk from a high school coach, it was still something that I had to ask permission for. That was the first time that I had come up with something like that. I always thought that when you did something positive that you would not be reprimanded. (Interview, 1/10/2013)

Elizabeth continued to describe her experiences working for this administration and the effects that this type of administrative style had on her personally. As a successful teacher, Elizabeth believes in the ability of teachers to have a positive impact on a school's environment. She continued to describe the effects of working for an authoritarian administrator on her personal satisfaction and enjoyment in career. In the following passage, Elizabeth describes the effects of working for this administrator.

> I would have gone somewhere else. My first two years under him, I had a lot of sleepless nights because I couldn't figure him out. You couldn't figure out what you could do that would be correct. If you stuck your neck out and made an extra effort, it was not something that was good. I had to make him believe that things were his suggestions in order to be

> able to do them. . . It is a difficult environment to work under when you have to work with somebody like that. When he left, it seemed like teachers in the building expanded their wings and started to try new things that would not have happened when he was there. Teachers did not feel the same pressure or stress. (Interview, 1/10/2013)

Elizabeth continued to describe the positive effect that an administration may have on a culture if the administration is supportive of their teachers and the school improvement process. According to Elizabeth, a supportive administration is necessary for a school to exhibit positive growth. In the following passage, Elizabeth described her experiences working with another administrator who had a completely different leadership style.

> Another administrator gave teachers a lot of room to grow and be nurtured. He had parameters, but they were not hard parameters. If a teacher did something that they were not supposed to, he would come down on them, and the next day he would move on. Things were more relaxed and easy going, but I think teachers started to flourish a little bit. Any time that you are excluded from making decisions and someone is telling you this is the way it is and you have no buy in, you lose your desire to be successful. (Interview, 1/10/20103)

According to Elizabeth, teachers need to be included in the school decisions that directly affect their ability to perform their jobs. If teachers believe that their opinions matter and they are provided with a supportive environment, then teachers will strive for excellence in the classroom, and teachers will work harder for their administration. However, if teachers feel as if their opinions have no bearing on the school culture, and they are not provided with the support necessary to be successful, then many teachers will move into survival mode, and they will not flourish.

For Elizabeth, the effect of the administration on a school culture served as a conduit for many of the major school reforms that took place over the course of her career. If the administration provided support and understood the needs of the teachers,

then the numerous school reforms were implemented well. However, if the administration did not provide support for their teachers, then the reforms were much more painful for the teachers to implement.

Academic Standards

Over the course of her career, Elizabeth worked with the QCCs and the GPS to help develop her curriculum. As a teacher in a small school, she was free to do almost anything that she wanted to teach her students about science. At the beginning of her career, Elizabeth used her intuition and personal preference to choose the science content that she would teach her students. Elizabeth would choose science content that she believed would benefit her students the most. After a few years of teaching, she was introduced to QCCs, which were supposed to guide her instruction. According to Elizabeth, "There were way too many objectives, and I felt like with the QCCs that the sky was the limit for science content" (Interview, 1/10/2013). Elizabeth would attempt to use the QCCs to guide her instruction, but ultimately the QCCs became a check off sheet that provided little benefit to guide her instruction. In the following passage, Elizabeth describes the methods that her department used to decipher the QCCs.

> I think when we first saw the QCCs, there were so many of them that we had to divide them into units. We divided them up because sometimes there was not a common thread. There were more opportunities to teach the same element under different standards. There was no continuity to the standards. Teachers would often hunt and peck for content that they wanted to teach. I do not think that teachers ever got a good understanding of the depth that they were supposed to teach content. You never knew how deep you should go. You never knew the breadth, or how much content to cover. Teachers would teach what they liked to teach more than the things that they didn't like. If they weren't familiar with something or they didn't want to teach it, then they would teach a small section even though that might be the biggest chunk of the test that we were giving. Teachers would still teach things that they liked more. (Interview, 2/6/2013)

During the implementation of the GPS, science teachers were sent to various meetings to attend professional learning to redeliver to their school science departments. As the science department head of a small rural school, Elizabeth was drafted to implement most school reforms with her department. Even though the GPS had fewer standards to teach, Elizabeth believes that the GPS was too vague to provide much guidance for teachers. In the following passage, Elizabeth describes some of the frustration that she felt with the nebulous implementation process.

> I really felt that the state did not do a good job rolling out the GPS. They were so broad, and it was like the state was waiting until teachers created units that were good. I don't know how many times we would do a unit until we thought we had perfected the units. Then we would start seeing the units that other schools did and we would compare our units to their units. Once again, we would question the depth of our learning units. Were we going deep enough? Were we challenging the students enough? Were we taking into consideration all of the learners, or were we just targeting specific groups? There were no fond memories of that process. Nobody knew what was right! The state department was telling us to find "the big idea"! If I heard that one time, I heard it a thousand times. What is the big idea on this unit? Well, I thought it had to do with cells. What about cells? Then we started getting into EQs. The standards started leading what we were teaching. I think that disturbed me. (Interview, 2/6/2013)

Unlike many teachers in south Georgia, Elizabeth worked very closely with the *Benchmarks for Science Literacy*. According to Elizabeth, she worked for approximately 15 years to deliver professional learning to teachers regarding inquiry based learning strategies. Elizabeth worked as an advocate for inquiry based learning strategies for much of her teaching career, but there were times when the ambivalence of the GPS and the QCCs caused her to question if she was teaching the appropriate material for student success on the GHSGT and other standardized tests.

Testing, Accountability, and Student Apathy

When students began taking the GHSGT, it became imperative for teachers to focus their instruction on the QCCs to ensure that their students would be successful on the test. According to Elizabeth, teachers did not necessarily know over which standards students were going to be tested. Therefore, teachers would work diligently to *cover* all of the material as effectively as possible. At the beginning of the GHSGT, school systems would compare their scores with other school systems to determine the quality of the schools. Because of the comparisons, Elizabeth's school system began implementing GHSGT study days to target all of the juniors who would take the GHSGT. In the following passage, Elizabeth describes results of the test preparation days and the effectiveness of the review sessions.

> Before the tests, we had a whole solid week of test preparation. The students did two days of back to back reviewing. Monday and Tuesday would be social studies and English for one group of 11th graders and we would review science and math with the other half of the students. Then we would flip-flop the students. It was a solid day. We would not take any breaks except for lunch. We would review the subjects that were our strengths. I might have taught cells, and somebody else might have taught evolution. So, that became the ritual every year the week before the test . . . For some of the students that were on the edge, the review was beneficial, but we had kids going to sleep because we were teaching so fast. We were trying to cover all that content from three years of school . . . Students would learn the content long enough to take the test, but the students would not remember any of the material after the test. (Interview, 2/6/2013)

In Elizabeth's school system, an interesting thing started to happen as a result of the GHSGT. According to Elizabeth, individuals in her school system began looking at the disparity in test scores between the different subgroups and some of the possible factors for the disparity. In the following passage, Elizabeth describes some of the conversations between the teachers.

> We began to look at the number of white students that passed the test versus the number of black students. The studious black students did not perform at the same level as the white students. We had great discussions about home life, education in the family, and the student's experiences. Did they take vacations? Did they go places? Did they experience some of the same things? So that's when we really started getting it down to Black, White, and Hispanic students. We started breaking down scores into subgroups of students. That is when reality hit about how they were going to target us with those different subgroups. (Interview, 2/6/2013)

When NCLB was passed, Elizabeth knew that her school system would have great difficulty achieving AYP because of the demographic make-up of the students. According to Elizabeth, much of the attention became focused on the lowest achieving students as a result of testing accountability. Elizabeth believes that much of the disparity between the achieving students and the under-achieving students is a result of the experiences of the students. With the necessity for all students to be successful, many teachers have inadvertently decreased their expectations and requirements in order to facilitate the student's passing the test. In the following passage, Elizabeth continues to describe the shift in academic focus away from higher achieving students to the lower achieving students and the effect that the shift had on the curriculum that the students received and the students' preparedness for college.

> That's where our mindset is. That's where our focus is and honestly our children coming through this school system have just gotten by. They've gotten by doing the minimum when we are attempting to prepare them for college. That is why many students don't have a lot of success at the college level. Students are not pushed to the limit, where they are responsible for their own learning. For example, if a research paper is due on a certain day and they don't turn it in on that day, then we will often-times allow them to turn it in later. No major tragedy or repercussions happened. However, when I was in school, a due date was a due date. In college, a due date is a due date. We have given in and listened to the whining and parents saying, "Oh well, it was my fault that they didn't get their paper typed up." The student didn't have to type the paper. The student could have written the paper, but we've allowed them those excuses and those leniencies. (Interview, 2/6/2013)

One of the trends that Elizabeth has noticed over the last 15 years has been a shift in responsibility from the students to the teachers. Elizabeth believes that as a result of the increased accountability for teachers, the teachers have started to take on an inordinate amount of stress and pressure to be successful in the classroom. Many teachers have decreased the level of rigor in their classrooms, and they have started accepting the bare minimum from their students because of standardized testing. According to Elizabeth, many teachers have almost resulted to "begging their students to do the minimum amount of work" (Interview, 2/6/2013). To Elizabeth, it seems as if teachers are held accountable for student success, regardless of the amount of effort that students put into becoming successful. Because of the increased level of accountability held by teachers, many teachers have changed their teaching methods and strategies in an attempt to improve student learning.

Student Learning and Teaching Methods.

According to Elizabeth, students have become increasingly apathetic with regards to science education over the last decade. Elizabeth credits NCLB and the increasing level of teacher accountability for much of the student apathy in science. For many years, science was taught as a secondary subject to math and language arts because students were not held accountable for their test scores in science. As a result, many students lack scientific reasoning skills when they enter a secondary classroom for the first time. According to Elizabeth, "Science is a very difficult subject, and I feel that because the students don't have a very strong foundation at the elementary level, by the time that they get to the middle school, they are behind" (Interview, 2/6/2013).

Even though many of Elizabeth's students entered her classroom lacking scientific reasoning skills, Elizabeth continued to utilize inquiry-based learning strategies until she left the classroom. Elizabeth believes that the best way to overcome student apathy is by providing them with meaningful learning opportunities requiring the students to think. In the following passage, Elizabeth describes her decision to continue using hands-on science labs to teach her students in the face of increasing accountability and testing.

> I don't care. The overall objective to teaching science is about the whole science. It is not picking what they think is the important thing. I'm telling you that I didn't do it. I did not do it and my student's test scores were probably some of the highest. I had many semesters where I had the lowest students, and the majority of their success was because of the hands-on activities that they did. It was a lot of work.

Elizabeth believes that students learn science best through hands-on experiences. Her ability to teach through hands-on experiences allowed her to spend 15 years developing and redelivering professional learning to science teachers. In the following passage, Elizabeth describes many of her teaching methods and lab experiences, and her perceptions of using inquiry-based teaching methods with her students.

> I had a balance in my class. I didn't like to lecture that much. I liked to use cooperative learning groups. We have all these tags and names to things that I was doing, but they just put a name to what we were doing in my classes. I tried to do labs two or three times a week, depending on the length of the lab and whether or not we had to go back in there to finish up something or break it apart. I always had a balance of lecture and lab so that didn't change . . . Many of my students did not like the inquiry-based labs. They wanted answers and for me to ask leading questions was like a burden to them. My students thought that they were supposed to walk into the lab, see something happen and understand it. But then you keep asking leading questions like, "Well, is that what you really think?" When they would walk out of that lab and they didn't have a solid answer, they were very mad. Many of my students were disturbed about the fact that a teacher could let them go for a whole hour to an hour and a half, do a lab and walk out and they didn't always get it at first. They didn't get the

> answer that they thought they should, or it was not as clear as they thought they should have gotten. The professor that I was working with said over and over again their madness or their anger was not really anger, but it was frustration. It was because they were learning. They were required to use brain cells to do something, and they did not always want to do it. (Interview, 2/6/2013)

In her role as an instructional leader, Elizabeth has fought diligently to improve science instruction in her school. For example, Elizabeth has worked to implement a school-wide science fair to help students become prepared for the rigor of high school sciences. According to Elizabeth, the science fair has been met with resistance from both teachers and parents because of the requirements for students to work independently with scientific concepts, but in the end, she believes the implementation of this program will prepare the students for the future.

School Reforms and Improvement

As a department chair and instructional leader, Elizabeth has implemented many of the school reforms and improvement strategies that have occurred over the course of her career. For example, she was heavily involved with the transition from the QCCs to the GPS. In her current position, Elizabeth has worked closely with many teachers to implement the new CCSS for both language arts and mathematics. Elizabeth will work with numerous science teachers when the NGSS are implemented as well. In the following passage, Elizabeth describes the numerous changes and trends that she has noticed over the course of her career, and the effects that these trends and changes have had on the teaching profession.

> I'd say the top change for education was No Child Left Behind. The second major change for education was transitioning to standards that made sense. We are moving from standards that were so broad that you really didn't know what to teach, and the test that you had no idea what kind of questions or what kind of content they were going to be tested

> over. Now, we know specifically what we want learners to learn. It is not that you teach tests, but you have a feel for the depth and breadth of the information that you're supposed to get to the students. You can go beyond that with some learners, and some learners you have to stick to just the basics. The third thing I think has changed greatly is the amount of control that teachers have over their classrooms. For example, when I was in school, whatever the teacher said as far as performance of the students in the classroom was determined by the teachers. My teachers told my parents what level I was, and what I needed, and there was never any controversy. My parents never disagreed with my teachers because my teachers were in control in the classroom. My parents only did homework with me at home and my teachers could see my areas of weakness. My parents looked to my teachers and the school for guidance. It was never that my parents, or any other parents, had the final say so in the education of the children. Now, it is reversed. I feel like the parents can tell you whose class they want their kids in. Parents can tell you what kind of instruction is too difficult. Some parents will say, "It's too difficult; my student can't do that; I don't have time to help my student." Well, the parents are not supposed to be doing it. The student is supposed to be doing it. It is explained at school. The materials are even now provided for students you know. There is no excuse for many students not to be able to do their work. Yet the parents are the driving force behind what happens in a school. We want parental involvement, but the parental involvement that we want is for them to help teachers be successful, not providing their students with excuses and becoming roadblocks to the learning process. (Interview, 2/13/2013)

The Common Core and the Next Generation Science Standards

Elizabeth believes that the implementation of the CCSS will be positive for many students because the CCSS allows for students to show growth in language arts and mathematics over the course of their education. However, Elizabeth also describes some of the frustration that she perceives with the implementation of the new curriculum. For example, Elizabeth believes that many students are not prepared for the rigor of the mathematics CCSS because they do not have the prerequisite knowledge to be successful. According to Elizabeth, if the NGSS is implemented correctly over the next few years, then students will benefit greatly. In the following passage, Elizabeth describes her vision for the NGSS in science education for all students.

> I believe the Next Generation Science Standards will be beneficial because of the engineering piece. That's the application that's been needed in science education. We have taught science, and students have learned science, but they have not been lifelong learners of science. With the engineering piece, I feel like that it is going to be the key to open a lot of these students at middle grades and high school levels to give students more directives than what their current interest levels would be with engineering. There are so many different jobs that go under the umbrella of engineering that kids need to see. When you say engineering, that doesn't mean I'm going to build buildings necessarily. Students could find some interest concepts and professions in engineering. Most of these kids are going to tech school and if they have got a career that has something dealing with engineering of some sort, whether it be in science or something else. They are finding jobs that are paying more after two years than most of us see in ten years. I think that will be a key for the success of most students. (Interview, 2/6/2013)

As an employee in a poor, rural school system, Elizabeth faced numerous school improvement cycles to help her school meet the requirements of AYP. However, her school system has failed to meet the demands of the legislation. As a result of failing to meet AYP, Elizabeth's school has consistently been under enormous pressure to improve under increasingly daunting odds. The increasing pressure for success has increased the stress and burn-out levels of most of the teachers at her school. However, in spite of the increasing pressures and stress teaching, Elizabeth continued to have hope for the teaching profession. In the final interview, she was asked to provide any of her final thoughts regarding the future of the teaching profession, and the following is what she said:

> I still think teaching is a good profession. I think it's a profession that you don't take lightly. I don't think that people need to go into education thinking that it's an easy job because it is not. If you are here for a pay check, then you need to find something else to do. This job comes with a lot of hats, and we need to nurture and to grow the seeds they say we plant. There are seeds that we are sowing in these kids every year. We impact the lives of our students. Every teacher has something to do with the way that that their students ultimately turn out. If we don't have good, strong support for our teachers, and our teachers are not steadfast and

> dedicated to the profession, then we're going to keep getting the same results. (Interview, 2/13/2013)

Summary

Elizabeth is a strong individual, who has endured numerous changes over the course of her career. As a teacher, she relished in the relationships that she built with her students and the lives that she positively impacted. Even though she was named as a Teacher of the Year on two occasions and STAR teacher on two occasions, Elizabeth finds her greatest professional satisfaction from the knowledge of performing her job well and helping her students to become successful in life.

Elizabeth's case study provides numerous insights into a teacher's heart and the impact that an administration has on teacher effectiveness. For Elizabeth, a positive administration influences a school's culture more than any other single type of school reform. Teachers who feel comfortable to attempt new teaching methods and strategies without the fear of condemnation for making mistakes can lead to the greatest amount of school improvement and change.

Chapter VII

CROSS-CASE ANALYSIS

The completed descriptive case studies found in Chapters 4, 5, and 6 provide the data base for cross-case analysis. The contextual backgrounds of the three research subjects provide the basis for the analysis of the three presented case studies. The constant comparative analysis of the presented case studies provided for the emergence of new themes regarding the participants' experiences as science teachers in the rural South. Even though their personal experiences in education show numerous variances with regards to their decisions to enter the field of education, the three subjects have been able to persevere through numerous changes and reforms over the course of their careers. Their own personal experiences are used to discuss the lenses through which the individuals viewed the numerous changes and reforms.

The cross-case analysis includes a comparison of the four major themes that developed throughout the development of the cases. Through constant comparative analysis of the three cases and comparative analysis of the cases, the four emergent themes include the rural influence on teaching, the standards and assessments, the administrative effect, and the effects of reforms. Each of these themes is characterized using the voices, examples and evidence found through interviews and the development of the previously presented individual cases.

The Rural Lifestyle Influence on Teaching

According to Carlsen and Monk (1992), rural science teachers are less experienced, more likely to have taught subjects other than science, less likely to have majored in science, and less likely to have a graduate degree than other teachers. However, Amy, Lauren, and Elizabeth directly contradict the assertions made by Carlsen and Monk. Beesley, Atwill, Blair and Barley (2010) made numerous assertions regarding the requirements of teaching in rural environments, and Amy, Lauren and Elizabeth demonstrated their abilities to meet the additional demands of working in rural environments for extended periods of time. As extremely successful and driven individuals, Amy, Lauren, and Elizabeth could have pursued any career that they wished to pursue. However, several factors influenced their decisions to become high school science teachers. The factors that led them to become high school science teachers resulted from their locations, families, and personal decisions. Lauren and Elizabeth became teachers because they could teach without having to leave their local communities or families for any extended period of time to pursue their educations. Amy chose to leave industry to enter teaching because of a relatively punitive working environment and the lack of jobs for analytical chemists in rural South Georgia.

Even though Elizabeth and Lauren could have made the decision to move to different schools or situations throughout the course of their careers, both stayed in the school systems from which they graduated for an extended portion of their teaching careers. For example, of Lauren's 30 years as a classroom teacher, only 6 were spent in a different school system. Elizabeth taught in the same school system for a total of 27 years before she was moved into an instructional coaching position. According to both

Lauren and Elizabeth, they stayed in their systems because they knew that they wanted their biological children to attend school in those systems and because that was where their families lived.

Amy does not have children, so her decision to move school systems was made as a response to personal preference and happiness. According to Amy, the constant stress of having to continually train new teachers and be responsible for an entire science department led her to move to a different school where her responsibilities outside of the classroom were decreased (Interview, 11/16/12).

According to Ingersoll (2003b), "Research on occupational choice and values has shown that an unusually large proportion of those entering teaching are motivated by what is called an altruistic or public-service ethic" (p. 168). Even though only Lauren chose to enter teaching while in college, both Elizabeth and Amy provided evidence of their early enjoyment of tutoring other students, or even mentoring students while working in industry. Elizabeth and Lauren also describe their experiences teaching Sunday school while growing up as positive experiences that helped them decide to become teachers.

As extremely successful students, all three participants had numerous options for their given professions. Even though Lauren was capable of pursuing a career in medicine or law, she chose to enter education because she was engaged to be married, and because she tutored students while in high school, Lauren always thought that she wanted to teach (Interview, 12/26/2012). As a college student, Lauren received numerous awards in her science courses, and her early successes in science allowed her

to choose a career as a science teacher. At one point during the interview process, Lauren describes teaching as being her "calling."

Even though Elizabeth was a very successful student, she had no desire to enter into the field of education while she was in college. Elizabeth's initial goal was to pursue a career in medicine. Because of Elizabeth's community ties, she was offered a teaching position, even though she only applied for a substitute teaching position to fill the time between shifts working at the local hospital.

As an analytical chemist, Amy took an interesting path towards the teaching profession. Because her husband accepted a teaching position at a regional university, Amy moved to rural south Georgia. Upon arriving in south Georgia, Amy found a position working in industry, but because she was unhappy with the working environment, she decided to find another job. However, in rural south Georgia, relatively few positions are available for individuals with Ph.D.s in chemistry. Therefore, after working for 8 years in industry, Amy decided to become a high school science teacher. Ultimately, Amy's dissatisfaction with a punitive working environment made her leave her career as an analytical chemist to become a high school science teacher.

The case studies document the impact that life experiences and personal choices have on the outcomes and experiences of the three teachers. For example, of the three cases, only Lauren made the choice to become a teacher while she was in college. Amy and Elizabeth almost became teachers on a whim. Amy became a high school teacher because she became increasingly unhappy with her first career choice as an analytical chemist and the working culture at her laboratory. Elizabeth's decision to become a

teacher occurred because she was available to accept an offered position in her hometown.

The numerous awards and commendations received by the three teachers over the course of their careers provide evidence for their excellence in the classroom. For example, all three teachers were named as Teacher-of-the-Year and STAR teacher on numerous occasions, and their excellence in the classroom allowed all three teachers to be provided with leadership opportunities within their respective school districts. Even though all three individuals received numerous awards and recognition for their excellence in the classroom, none of the participants listed the awards and recognition as their primary source of satisfaction and enjoyment from teaching. Elizabeth, Amy, and Lauren emphatically described the jubilation that they would feel from the internal knowledge that they performed their jobs well.

Even though Elizabeth did not describe her decision to enter teaching as being a "calling" in the same manner that Lauren described her decision to enter teaching, Elizabeth identifies with many of the same reasons for continuing to teach, even when teaching became more difficult.

> It's when a light bulb comes on for some students. That is when they finally understand what's going on. When somebody is given this terminology, and they don't really grasp it, but then you give them labs, or you explain it in a certain way, or you show a demonstration and the kid actually says, "Well, that's why this happens, or this is how it happens, or that's the way it works, or I always wondered why something would happen." Those kinds of ah-hah moments, they keep you coming back. (Interview, 1/10/2013)

In the following passage, Amy provides an example of a moment that provided her with immense satisfaction from teaching, and the knowledge that she did her job well.

> I love seeing the students succeed. You see one finally, the light bulb goes on. That keeps me going. Like I said, I enjoy the successes (that students have). I care about the students that are allowed to go to the UGA Stars. When they progress, a lot of times I will get thank you notes back (from students). I usually don't get them while I am in the school year. I usually get them after they go off to college. My best compliment was from one of the school board members at the small school. We were standing in line at this banquet and he turned around and said, "Derek said you were the one who best prepared him for college." Thank you! And then I heard later, that gentleman was at one of the baseball games and heard some kids kind of bad mouthing me, and he turned around and said, "You listen to her, she will teach you something." The satisfaction of knowing you've done a job well. (Interview, 12/07/2013)

In the same manner as Amy and Elizabeth, Lauren provided the following example of one of one of her classroom experiences that provided her with a sense of pride and feeling of performing her job well. In the following passage, Lauren describes one particular incident in which she felt some of the greatest satisfaction from teaching.

> When students don't understand something and then, all of the sudden, they do understand it, that's very rewarding. I had a student once, who was just an average student, "C" level student, struggling in physical science when we learned how to write formulas and name compounds. She caught onto it quickly, but for some of my "A" students, the light bulb didn't come on immediately with them. So I asked her to help some of those students. I gave them a sheet where they had to do some of the problems. I said, "You are going to help them. You understand it. They don't understand my explanation so far, so maybe you can talk to them and they will understand how you think about this." She explained it and the students caught on and she was so proud. Her grades came up after that because she thought that she could do the work, and she was willing to try a little harder. So the light bulb came on in her and she got some recognition for the fact the light bulb had come on. Those little victories, the little things…add up a lot. (Interview, 12/26/2012)

The three individuals described numerous sources of stress that occurred over the courses of their careers. For the three participants, the greatest source of stress occurred when they were made to feel overwhelmed by situations that were oftentimes out of their control. The increased levels of stress increased because of the numerous responsibilities

that the teachers had inside and outside of the classroom. For example, while Amy worked at the small high school, she was oftentimes held responsible for making sure that all of her students learned complex scientific material, as well as serving on numerous leadership teams and committees. In the following passage, Elizabeth describes the manner in which she would find refuge from the numerous stresses of teaching.

> You have to be a self-motivator to go back into the classroom every day. When it becomes frustrating, you have to decide that it is okay to shut your door and teach science. You have to do summer workshops, work with the college, and get inspiration from sharing science techniques with other people. I think that was my life saver. I was able to go to different school settings and teach elementary teachers how to teach science so that students would be interested in science when they got to high school. I believe that that's where I got my batteries recharged. I worked with teachers who had little knowledge about doing labs and incorporating science into reading lessons. You know you did a good job teaching science by getting students to want to become science teachers or go into other science fields. When you have kids wanting to become involved with science, you know that you have been a positive inspiration, and you helped them along. (Interview, 1/10/2013)

Gibson and Dembo (1984) describe teachers' efficacy as the degree to which teachers believe that they can teach students in spite of the students' IQ, home, family, and school conditions. Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) argued that teaching efficacy may change as a result of the situation in which a teacher finds himself of herself. Kurz and Knight (2004) made assertions that personal teaching efficacy and general teaching efficacy are significant predictors of the collective efficacy of a school. Amy, Lauren, and Elizabeth described their personal beliefs that they could teach any students who had a desire to learn, indicating that they have a high level of personal teaching efficacy. However, Amy, Lauren, and Elizabeth provided evidence that a school's administration plays a large part in influencing the efficacy beliefs of teachers within a school.

The Administrative Effect on Teaching

Lauren and Elizabeth described several situations in which their teaching practices were influenced by their administrations. In the following passage, Lauren describes a situation in which she believes that her administration caused a teacher to quit teaching because of a lack of support.

> There was one time I had a very bad principal. For the most part, I was blessed with very good and supportive principals. They were not supportive of just me, but all of the teachers. Then I had a bad principal that made a teacher cry one day. She did nothing wrong, and he made her cry. I just thought nobody should ever make this sweet teacher who works so hard and is so brilliant cry. I thought, "We are going to lose her because of this." And we did. She quit! She quit! She got out of teaching because of it. That kind of thing just really disheartened me, that somebody like that could move up to the level of administrator and then have such a bad impact on teachers. Teachers need to have their morale boosted, and he was tearing everybody's morale down. (Interview, 12/26/2013)

Elizabeth described a working situation in which an administrator placed an inordinate amount of stress on his teachers because of leadership style. In the following passage, Elizabeth described the effects of working for an extremely punitive administrator and the decisions she would have made if the situation had not changed and then she continues to describe the effect of working for an administrator with a completely different attitude towards teachers.

> I would have gone somewhere else. My first two years under him, I had a lot of sleepless nights because I couldn't figure him out. I couldn't figure out what I could do that would be correct. If you stuck your neck out and made an extra effort, it was not something that was good. I had to make him believe that things were his suggestions in order to be able to do them. . . It is a difficult environment to work under when you have to work with somebody like that. When he left, it seemed like teachers in the building expanded their wings and started to try new things that would not have happened when he was there. Teachers did not feel the same pressure or stress . . . Another administrator gave teachers a lot of room to grow and be nurtured. He had parameters, but they were not hard parameters. If a teacher did something that they were not supposed to, he would come

> down on them, but the next day he would move on. Things were more relaxed and easy going, but I think teachers started to flourish a little bit. Any time that you are excluded from making decisions and someone is telling you this is the way it is and you have no buy in, you lose your desire to be successful. (Interview, 1/10/20103)

Academic Standards and Assessments

Amy, Lauren, and Elizabeth described at length the numerous changes and reforms that they experienced over the course of their careers. As successful teachers, the three individuals both applauded and despised many of the educational changes that they withstood. As leaders in their schools, the three teachers described the transitions that occurred as new curriculum requirements and standardized assessments were introduced. For example, all three teachers described the methods that they used to choose the material that they taught while using the QCCs. According to Elizabeth, "There were way too many objectives, and I felt like with the QCCs that the sky was the limit for science content" (Interview, 1/10/2013). According to Lauren, the QCCs were supposed to be used in their school-wide curriculum guides, but "for the most part, curriculum guides were done because they were required and then they were put on a shelf" (Interview, 1/05/2013). Amy would use the QCCs to guide her instruction in biology because she was not as comfortable teaching biology as chemistry. However, when Amy taught chemistry, she relied on her personal knowledge of the subject matter to guide her instruction.

For Amy, Lauren, and Elizabeth, the introduction of the GHSGT led them to make drastic changes to their teaching strategies and the school-wide policies for content review. For example, all three teachers described week-long study sessions that occurred to help students pass the GHSGT in science. Amy, Lauren, and Elizabeth all believed

that the students did not truly learn the content for a long period of time, but long enough to take the test. Lauren made the decision to change the focus of instruction away from the prescribed QCCs to the Department of Education's released testing objectives. According to Lauren, when the testing objectives were released, the teachers knew the material students needed to learn in order to become successful on the exam, and they focused on the testable material to improve the students' ability to pass the tests because the schools were now going to be judged according to student test scores.

The three teachers described the increasing level of accountability that has occurred as a result of standardized testing and their responsibility to obtain higher test scores under increasingly tough odds. Amy, Lauren, and Elizabeth described their frustration regarding their increased accountability for student success on standardized tests. In the following passage, Amy describes the feelings that she has when her students exhibit increased apathy regarding learning complex material.

> They are just not ready to do, or they haven't been challenged enough. I feel like that because I will say, "Don't you remember seeing this?" You should have seen this before and they are like no and such, but this is more of opinion than anything research based. It is just that you know watching my students that they will not necessarily answer anything without finding an answer in a book. It's got to be in the book for students to understand. For example, this week we talked about solubility in class. I gave them the example of making sweet tea. I asked them, "When do you add the sugar? When do you add it to make the tea sweeter?" You know, the students wanted to find it in the book. I said, it is not in the book. Think about what you are doing. You know you have done this before. (Interview, 11/30/12)

Another transition that Amy, Lauren, and Elizabeth described was the transition from the QCCs to the GPS and the accompanying EOCT. Amy and Elizabeth had to work through the implementation process of the GPS in each of their schools, but Elizabeth described in detail her opinion of the implementation process that accompanied

the GPS. In the following passage, Elizabeth describes much of the ambiguity that she felt as the GPS was unpacked for all school systems.

> I really felt that the state did not do a good job rolling out the GPS. They were so broad, and it was like the state was waiting until teachers created units that were good. I don't know how many times we would do a unit until we thought we had perfected the units. Then we would start seeing the units that other schools did and we would compare our units to their units. Once again, we would question the depth of our learning units. Were we going deep enough? Were we challenging the students enough? Were we taking into consideration all of the learners, or were we just targeting a specific group? There were no fond memories of that process. Nobody knew what was right! The state department was telling us to find "the big idea"! If I heard that one time, I heard it a thousand times. What is the big idea on this unit? Well, I thought it had to do with cells. What about cells? Then we started getting into EQs. The standards started leading what we were teaching. I think that disturbed me. (Interview, 2/6/2013)

As teachers became increasingly accountable for student success, Amy, Lauren, and Elizabeth started to notice some disturbing trends regarding student learning. According to Amy, Lauren, and Elizabeth, there were numerous times in their classes where they believed that they cared more about the students learning science material than the students. The increased level of student apathy has resulted in many of the successful teachers having increased levels of stress and dissatisfaction with their careers. According to Elizabeth, many teachers have resulted to "begging their students to do the minimum amount of work" (Interview, 2/6/2013).

One side-effect of the standardized testing movement that was identified by Amy, Lauren, and Elizabeth is the unwillingness of many students to answer open-ended questions on exams because their students have become accustomed to multiple-choice standardized tests. Amy illustrated this trend when she said the following:

> They will at least guess on the multiple choice questions. If I ask them to explain something, a good majority of them will not answer that question

> or they write one word down for an explanation. If it is not a test, I will say, "If I explain to you, if you ask me a question like how do you calculate grams, if I told you add, you know one word is not going to do it, is it?" They just don't want to write out an explanation. They don't. If I ask them a question that requires a little bit of thought, a lot of them will skip it. (Interview, 11/30/12)

The Effects of Reform on the Teaching Profession

Amy, Lauren, and Elizabeth identified numerous changes that have occurred in science education over the course of their careers regarding personal teaching methods, student learning, and the need for continuous improvement.

Lauren and Elizabeth provided descriptions of the numerous changes that they made in their teaching methods due to the implementation of various policies. One policy that positively changed their teaching methods involved documenting the increased use of laboratory exercises in their classrooms. Due to the requirement to use laboratory exercises during 25% of their classes, Lauren began to change many of her teaching methods as she gained increased pedagogical knowledge. In the following passage, Lauren described the evolution of her teaching methods over the course of her career from being primarily lecture based to becoming more inquiry-based.

> Some of my methods came from how I was taught, but over the years I think I developed my own style. I had some wonderful teachers in high school and a few good ones in college after which I modeled some of my teaching, but at that time, it was mostly lecture, and when I first started teaching, that was my main teaching method. I moved away from lecturing. My classes did more hands on, more labs, and I wouldn't just put a video tape in or later years a DVD and just have students sit and watch it. We were doing something with the material. My classes were more interactive, and of course began to use computers a little bit towards the end of my career. (Interview, 1/ 05/2013)

For 15 years, Elizabeth spent many of her summers teaching professional learning to teachers regarding the use of inquiry strategies in their classrooms. According to Elizabeth, students learn science the best when they are actively involved in the learning

experience. In the following passage from Elizabeth's case study, Elizabeth describes the methods that she used to teach science to students of all academic levels.

> I had a balance in my class. I didn't like to lecture that much. I liked to use cooperative learning groups. We have all these tags and names to things that I was doing, but they just put a name to what we were doing in my classes. I tried to do labs two or three times a week depending on the length of the lab, and whether or not we had to go back in there to finish up something or break it apart. I always had a balance of lecture and lab so that didn't change . . . Many of my students did not like the inquiry-based labs. They wanted answers, and for me to ask leading questions was like a burden to them. My students thought that they were supposed to walk into the lab, see something happen and understand it. But when you keep asking leading questions like, "Well, is that what you really think?" Then they would walk out of that lab and they didn't have a solid answer and they were very mad. Many of my students were disturbed about the fact that a teacher could let them go for a whole hour to an hour and a half, do a lab and walk out and they didn't always get it at first. They didn't get the answer that they thought they should, or it was not as clear as they thought they should have gotten. The professor that I was working with said over and over again their madness or their anger was not really anger, but it was frustration. It was because they were learning. They were required to use brain cells to do something, and they did not always want to do it. (Interview, 2/6/2013)

Over the course of her career, Amy has made many changes to her teaching methods and strategies to help her students become successful in chemistry. According to Amy, many of the school reforms and improvement strategies have been "recycled under a different name" (Interview, 11/30/2012). However, when presented with a teaching strategy, Amy would ultimately make the decision to continue to use a strategy because she deemed the strategy beneficial to her instruction. In the following passage, Amy described the use of inquiry-based teaching strategies in her classroom.

> I heard about it, looked at it, and thought, is it going to be truly inquiry-based? I don't have time to wait on them to decide to figure out something. And so I said, it was not something I would try to incorporate. I'd heard about it. It would be nice to try, but it wasn't going to be anything that I would do every day. They might have one or two activities that I might use. It would probably be guided inquiry, where you lead

> them a little more and that would be more conducive to what I do or am doing now. I'll tell you, my AP class found some virtual labs on gas laws on the internet so they are manipulating that and one of my students said, "This isn't changing." I said, "That's what you are supposed to notice, that if you kept this going, that wasn't supposed to change." So that's more guided in my mind, more guided inquiry where I didn't stand up there and tell them that, but I gave them this activity that said, you know plot this data. What do you see? So I don't know if that is truly inquiry based, but to me it is a little more helpful if they can figure it out. It's a shift to let some of my students have time to figure out scientific concepts. (Interview, 11/30/2012)

Over the courses of their careers, all three participants made changes to their instructional practices to help their students become successful and to improve their students' scores on the GHSGT and the EOCT. According to Amy, Lauren, and Elizabeth, as they became more accountable for the student achievement, the students in their classes seemed to become increasingly apathetic. To Amy, Lauren, and Elizabeth, it seems as if they had to almost beg some of their students to attempt to do increasingly challenging course work. According to Elizabeth, many teachers have almost resorted to "begging their students to do the minimum amount of work" (Interview, 2/6/2013).

Amy, Lauren, and Elizabeth described the increasing level of frustration that they feel with regards to student apathy, and the decrease in their students' abilities to think for themselves regarding scientific concepts. According to Amy, Lauren, and Elizabeth the increased importance of standardized tests over the last ten years has had multiple effects on the educational landscape. The combination of increasing teacher accountability and concurrently increasing student apathy has placed greater demands and stress on the most successful teachers. Surprisingly, when all three participants were asked if they would enter education at this point in time, all three answered emphatically *no*.

The Common Core and the Next Generation Science Standards

The introduction of the CCSS for science teachers has added another hurdle for many science teachers to pass. In their roles as teachers, school improvement specialists, and instructional coaches, Amy, Lauren, and Elizabeth have various opinions regarding the newest curriculum. The consensus among the three individuals is that the CCSS will have a positive effect on education in Georgia, but they expressed concern regarding the difficulty that many teachers may experience when getting students to perform with regard to the new standards. In the following passage, Amy provided a description of the thought process that she had regarding the CCSS for science.

> A few of us met back in October to look at the literacy standards and start making examples. So I went through the 11th and 12th grade CCSS literacy standards and figured out that we were to increase science literacy and help students to read and process material. Well, any lab would fit that standard. Another one of the standards was to have them (the students) design one lab. Another standard was about writing an article. There are some places where we already perform these actions, and there are some times I do these things . . . The problem will be getting students to perform these actions. Then yes, because this is kind of everyday life. I have to read instructions and process what's going on, and I have to write. Students say, "This isn't English class. I don't have to write paragraphs." I told my students, "You know I went into science thinking I could get out of writing. Well, you don't get out of it. You know that is one of those things; you have to be able to write stuff. You have to be able to write, and you have to be able to communicate; that's true of anything, of anything you decide to go into." I guess we get frustrated because we are hoping students are going for something better than, "Do you want fries with that?" You know, especially to take chemistry, you are thinking they are thinking to go above a minimum wage job to get certification in something . . . If the standards can be implemented and we can hold to those standards, then they will be beneficial. (Interview, 11/30/2012)

As leaders in science education, Amy, Lauren, and Elizabeth have had the opportunity to review the NGSS, which are anticipated to be released in the next few years. According to Elizabeth, if the NGSS are implemented correctly, then all students

will be able to benefit from the increased processing skills and scientific knowledge. In the following excerpt, Elizabeth provided her vision for the NGSS in science education.

> I believe the Next Generation Science Standards will be beneficial because of the engineering piece. That's the application that's been needed in science education. We have taught science, and students have learned science, but they have not been lifelong learners of science. With the engineering piece, I feel like that is going to be the key to open a lot of these students at middle grades and high school level to give students more directive than what their current interest levels would be with engineering. There are so many different jobs that go under the umbrella of engineering that kids need to see. When you say engineering that doesn't mean I'm going to build buildings necessarily. Students could find some interest in engineering. Most of these kids are going to tech school and if they have got a career that has something dealing with engineering of some sort, whether it be in science or something else. They are finding jobs that are paying more after two years than most of us see in ten years. I think that will be a key for the success of most students. (Interview, 2/6/2013)

With the promise of the NGSS on the horizon for science education, Lauren reminded me of the realities of school reforms and curricular changes. According to Lauren, there are numerous variables that will affect the implementation of the NGSS, and the reality may be completely different for science teachers than the original intention. In the following passage, Lauren provided her thoughts regarding the outcome of the NGSS.

> I think we are beginning to see an increased emphasis on math and science as we're competing with countries that are scoring so much better than the United States on international standardized tests. We're seeing more talk, and I hope that the talk will be followed by more funding for science and math. It's kind of a roller coaster. After Sputnik, we saw more interest in math and science and more funding. We're seeing more emphasis on science. The fact that science was to be a second indicator under AYP is another indication of the increased emphasis. It's another trend or cycle that we're seeing. I would like to say the pendulum is swinging from one side to the other, like student accountability to teacher accountability. If we could hit everything in moderation, and if we could get the legislators to keep their noses out of everything, and if we could keep them from micro-managing through all their laws, then we might be able to reach that

> moderation, but every President has an agenda, every Governor has an agenda, and all the legislators have their things that they believe in and they want to do. It changes from one administration to the other, and one state school superintendent to another. (Interview, 1/12/2013)

Summary

In the cross-case analysis of case studies of Amy, Lauren, and Elizabeth, the four themes of the rural influence on teaching, the administrative effect on teaching, standards and assessments, and the effects of reforms on science teachers were further analyzed. Even though the three individuals worked in completely different school systems and environments, their thoughts regarding school reforms and school improvement echoed each other.

Amy, Lauren, and Elizabeth were affected greatly by the changing landscape of education, and they described the increasingly difficult aspects of teaching science as a career. Because of the increasing amount of scrutiny, teachers must have greater success with fewer resources. The success of the NGSS and CCSS over the next few years will be largely determined by amount of support that teachers are provided to implement these reforms with fidelity.

Chapter VIII

DISCUSSION AND IMPLICATIONS

> American schools and the people who work in them are being asked to do something new – to engage in systemic, continuous improvement in the quality of educational experience of students and to subject themselves to the discipline of measuring their success by the metric of students' academic performance. Most people who currently work in public schools weren't hired to do this work, nor have they been adequately prepared to do it either by their professional education or by their prior experience in schools. (Elmore, 2002, p. 3)

The case studies of three master science teachers provided their experiences and perceptions of school improvement and reform over the course of their careers. These teachers described the changing working experiences as the level of accountability for science teachers has increased in response to the increase in standards and the associated assessments. As individuals who gained the most satisfaction from the successes of their students in life, these teachers have become increasingly frustrated and overwhelmed by the demands to document every action that they take and by every new requirement that they must fulfill in order to be deemed e*xemplary* by their administrators.

The three case studies present individuals who possess a high level of self-efficacy and teacher-efficacy. Amy, Lauren, and Elizabeth each described their personal beliefs that they could teach any student who had a desire to learn. However, Amy, Lauren, and Elizabeth described an increasing level of apathy among their students with regard to learning complex scientific material due to the increase in standardized testing requirements for all students. These teachers, who personally defined their success by

the influence that they have on students' lives, have been forced to accept a new definition of success that is defined by student achievement on standardized assessments and by administrators' evaluations of specific behaviors.

Many teachers enter the field of education because they have an innate desire to help young people become successful in life (Ingersoll, 2002, 2003b). The discrepancy between the altruistic, internal motivation to help students succeed in life and the external motivation to achieve high test scores leads many teachers to experience a great discontentment with their choice to enter teaching. Amy, Lauren, and Elizabeth each expressed the increased level of stress associated with the need to have high test scores, from students who either exhibit apathy towards the subject matter or do not have the innate ability to perform well in science.

Over the course of their careers, Amy, Lauren, and Elizabeth experienced numerous changes in science education. As school leaders, they were required to help their schools implement any school reforms or instructional changes. For these three individuals, the implementation of QCCs during the 1980s did not have any direct influence on the content that was taught within their classrooms. According to Amy, Lauren, and Elizabeth, they would often times decide the content that they wanted to teach, and then they would identify the corresponding standard. However, in the mid-1990s the introduction of the GHSGT for science forced them to focus on the QCC standards. Because of the breadth of the standards, Amy, Lauren, and Elizabeth were still left with very little direction for their curricula until the state of Georgia released the GHSGT testing objectives. Once the testing objectives were released, they began to make their instruction align with the testing objectives. The introduction of the GPS and

corresponding EOCT in the early-2000s led Amy and Elizabeth to focus their instruction accordingly. However, the teachers worked for several years to narrow their instruction so that their students would achieve success on the EOCT tests.

The effective implementation of the CCSS and the NGSS over the next few years will be determined by a different generation of science teachers, but Amy, Lauren, and Elizabeth seem to be optimistic about the future of science education. Even though students appear to be apathetic with regard to writing and thinking critically, the increase in rigor and academic standards may be positive. The shift towards the CCSS and NGSS may be turbulent in the beginning because of the gap between the knowledge and skills of students changing from one set of standards to a different set of standards. However, the true driver of school reform and improvement will be the associated assessments of the standards.

Even though Amy, Lauren, and Elizabeth have either retired from education, or they plan on retiring from education in the near future, their insights regarding school reform and improvement are invaluable. Through their case studies, their *voices* can be heard. The lessons gleaned from their case studies provide many insights into the future of education, and the actions that should be taken in order for schools and science education to improve.

Implications for Administrators

In the increasingly stressful world of public education, it is the responsibility of the school administration to provide the support necessary for teachers to be successful (Valencia, 2010). The administration within a school serves as a conduit through which the school culture is defined. If an administration values innovation, and provides

meaningful support for his or her school staff, then a school will become successful. Whitaker (2004) identifies that a school is not improved because of the implementation of any one program, but rather because of the teachers working in the school. An administration that empowers his or her staff to make decisions regarding instructional practices and school policies will increase both morale and effectiveness (Goodlad, 2004; Whitaker et al., 2009).

Lauren effectively described a shared governance approach that should be used when implementing school-wide reforms or strategies. If teachers are provided with the opportunity to make meaningful decisions regarding their work environment, then they will exhibit increased ownership and responsibility for the decision. Many times teachers have more experience in a system or school than their administration. These teachers should be used for their expertise regarding school policies and decisions.

Elmore (2002, 2007) described the continuous cycles of reform and improvement that many teachers have undergone. Administrators should consider the opinions of their most experienced staff members because of their knowledge and experiences with school reform and change. Teacher perception of their working environment is critical for the stability of our schools, and teachers who leave the profession often cite stress as one of the primary reasons for leaving (Brown, 2011; Green, 2003; Van Roekel, 2011). According to Walington et al. (2004), teachers should be provided with effective mentoring, staff development and technical assistance if they are going to be held accountable for the success of all of their students.

Implications for Policy Makers

The case studies provided evidence for the importance of aligning the required teaching standards to the associated assessments. For Amy, Lauren, and Elizabeth, their ability to teach standards that they knew were on the standardized assessments provided them an increased opportunity to show success on the standardized tests. Essentially, teachers are not evaluated on their ability to teach, but rather on their ability to teach concepts in a manner that corresponds to a standardized test.

The intention of standardized tests is to assess student knowledge so that they may receive additional instruction or remediation (Ravitch, 2010; Young, 2012). However, the increased emphasis placed on mathematics and reading test scores led to the other subjects, such as science, becoming neglected by many schools (Au, 2007; Levy et al., 2008; Ravitch, 2010; Young, 2012). For high school science teachers, the void that was created in science education because of the lack of emphasis in the early grades led to a gap that could not be made up for in high school classrooms (Nelson & Landel, 2006). The introduction of the CCSS and NGSS may provide the opportunity to improve the educational outcomes for all students if they are properly implemented.

When the Benchmarks for Science Literacy were first published, very few science teachers knew that they existed. If science teachers are not properly educated regarding the Frameworks for Science Literacy and the corresponding NGSS, the results may be the same for science education. In the current educational and economic climate, it is imperative that states and local boards of education provide the requisite professional development and support the implementation of these standards. If teachers are not

supported in the implementation of the new standards, many will resort to continuing in their current instructional practices.

For science teachers to be considered successful, they must understand multiple cognitive, content, and social concepts (Davis et al., 2006). However, many school systems do not provide the support necessary for teachers to become proficient in all of these areas. Instead, many administrators evaluate teachers negatively, but will not provide the support to help teachers improve. One possible remedy to this dilemma is the employment of an instructional coach. Killion and Harrison (2006) described the many roles that may be facilitated by instructional coaches within a school to improve instructional strategies and implement school wide reform and improvement. Effective instructional coaches help create a collegial environment in which teachers feel the freedom to attempt new instructional strategies without fear of receiving a poor evaluation. Teachers are provided feedback and support to help improve the use of teaching strategies.

Mangrubang (2005) and Ingersoll (2003a) identified an impending shortage of high-quality science teachers, and President Barack Obama even called for an increased supply of high-quality science teachers in his 2013 State of the Union address. However, new science teachers in rural school systems rarely receive mentoring or support to help them succeed with the numerous demands of teaching science. The current system of teacher evaluation, in which teacher performance is judged on one or two days, is insufficient for improving instruction and enacting school reform. However, very few school systems employ individuals to fill the role of instructional coaches in a school to provide the support necessary for all teachers to be successful in the classroom.

Limitations and Implications for Future Research

One major concern of case study research is the ability to create generalizations that apply to a larger population from a single case or group of cases (Yin, 2009). Because of the considerable amount of time required to conduct case study research, this study was limited to three individuals to make the study accomplishable within a reasonable amount of time.

The 3 individuals in this study were identified as master teachers because of their commendations for teaching excellence, personal recommendations, and the amount teaching experience that they possess. The 3 individuals were female teachers located in rural South Georgia. The individuals had over 20 years of teaching experience, and they have all taught multiple science subjects over the course of their careers. The individual characteristics of the teachers provide the reader with examples of the experiences and perceptions of white, female science teachers from the rural south. However, the experiences and perceptions of individuals from other demographic groups may vary significantly from the three individuals studied in this dissertation.

The case studies of master science teachers led to the development of numerous questions to be studied in future research. The case study model presented in this dissertation may be duplicated with other disciplines to increase the knowledge of teacher experiences with school reform and improvement. The *voices* of master teachers should be considered when any school reforms or improvement models are implemented. The decrease in elementary science education has been widely documented, but experienced elementary teachers should be provided with a *voice* regarding their experiences with school improvement and reform.

Susan Moore Johnson, Peter Jackson, Ken Macrorie, and Peter McLaren provided insight into the lives and experiences of teachers in their respective books. In the wake of NCLB, RTTT, CCSS, and the upcoming release of the NGSS, it is imperative that teachers from all disciplines, grade levels, and geographical areas be provided with a *voice* regarding the numerous school reforms and policies that are implemented in the name of school improvement (Young, 2012).

Discussion

The increased emphasis on mathematics and reading led to a decline in science education over the last decade. The introduction of the CCSS and NGSS may provide for a means to improve science education. However, as the case studies illustrated, administrators, school systems, and policy makers need to allow schools the adequate time necessary to see the results of reform efforts. School change and reform is not automatic, and teachers become increasingly frustrated because of the revolving changes in the name of reform (Young, 2012).

In the current times of economic uncertainty, when teachers are being furloughed and not being provided with adequate professional learning opportunities, school improvement and reform becomes increasingly difficult. It is imperative for school administrators to listen to the needs and advice of their teachers to ensure that schools are able to meet the challenges of reform.

The implementation of the CCSS and NGSS provide an opportunity for student learning to shift from an emphasis on multiple choice standardized tests to authentic learning for the next generation. As educators, we must recognize the potential of this

moment in time to change the face of education and place a renewed emphasis on science education in our schools.

Susan Johnson Moore (2011) identified a shift in the teaching workforce from having more experienced to less experienced, younger teachers. With the retirement of teachers, the workforce will lose the greatest supply of knowledge and experience regarding educational policies and practices. The cases studies that have been presented capture some of their wisdom, but it is my hope that their wisdom will not be discarded. According to Young (2012), the ability to reform our schools is dependent on our ability to hear the *voices* of the people involved in the implementation of our policies. It is imperative that administrators and policy makers make a concerted effort to listen to the advice and experience of the generation of teachers who are beginning to exit our schools.

REFERENCES

Alberti, S. (2013). Making the shifts. *Educational Leadership, 70*(4), 24 - 27.

Anyon, J. (2005). Policy? Notes toward a new paradigm. *Harvard Educational Review, 75*(1), 65 - 88.

Au, W. (2007). High-stakes testing and curricular control: A qualitative metasynthesis. *Educational Researcher, 36*(5), 258-267. doi: 10.3102/0013189X07306523

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1997). *Self-Efficacy - The Exercise of Control*: W. H. Freeman and Company.

Barter, B. (2008). Rural education: Learning to be rural teachers. *Journal of Workplace Learning, 7*(8), 468 - 479. doi: 10.1108/13665620810900292

Beesley, A. D., Atwill, K., Blair, P., & Barley, Z. A. (2010). Strategies for recruitment and retention of secondary teachers in central U.S. rural schools. *The Rural Educator, 31*(2), 1-9.

Bobeck, B. L. (2002). Teacher resiliency: A key to career longevity. *The Clearing House, 5*, 202 - 205.

Brooks, J. G., & Dietz, M. E. (2013). The dangers and opportunities of the common core. *Educational Leadership, 70*(4), 64 - 67.

Brown, D. (2011). Rocket fuel: Teacher support for energized classrooms. In D. Drury & J. Baer (Eds.), *The American Public Teacher: Present, Past, & Future* (pp. 57 - 67). Cambridge, MA: Harvard Education Press.

Bryant, J. A. (2010). Dismantling rural stereotypes. *Educational Leadership, 68*(3), 54 - 58.

Burton, M., & Johnson, A. S. (2010). "Where else would we teach?": Portraits of two teachers in the rural south. *Journal of Teacher Education, 61*(4), 376-386. doi: 10.1177/022487110372362

Bybee, R. W. (2011). Scientific and engineering practices in K-12 classrooms: Understanding a framework for K-12. *The Science Teacher, 78*(9), 34-40.

Carlson, W. S., & Monk, D. H. (1992). Differences between rural and nonrural science teaches: Evidence from the longitudinal study of American youth. *Journal of Rural Educatoin, 8*(2), 1 -10.

Carr, J. F., & Harris, D. E. (2001). *Succeeding with Standards: Linking Curriculum, Assessment, and Action Planning*. Alexandria, VA: ASCD.

Conley, D. T. (2003). *Who Governs Our Schools? Changing Roles and Responsiblities*. New York: Teachers College Press.

Darling-Hamond, L. (2003). Keeping good teachers. *Educational Leadership, 60*(8), 6 - 13.

Davis, E. A., Petish, D., & Smithey, J. (2006). Challenges new science teachers face. *Review of Educational Research, 76*(4), 607 - 651.

Doorey, N. A. (2013). Coming soon: A new generation of assessments. *Educational Leadership, 70*(4), 28 - 34.

Duschl, R. A. (2012). The second diminsion - crosscutting concepts: Understanding a framework for K-12 science education. *The Science Teacher, 79*(2), 34-38.

Elmore, R. F. (1996). Getting to scale with good educational practice. *Harvard Educational Review, 66*(1), 1-26.

Elmore, R. F. (2002). *Bridging the Gap Between Standards and Achievement: The Imperative for Professional Development in Education.* Washington DC: The Albert Shanker Institute.

Elmore, R. F. (2007). *School Reform From the Inside Out: Policy, Practice, and Performance* (4th ed.). Cambridge, MA: Harvard Education Press.

Eppley, K. (2009). Rural schools and the highly qualified teacher provision of *No Child Left Behind*: A critical policy analysis. *Journal of Rural Educatoin, 24*(4).

Fry, S. W., & Anderson, H. (2011). Career changer as first-year teachers in rural schools. *Journal of Rural Educatoin, 26*(12), 1-15.

Fullan, M. (2001). *Leading in a Culture of Change*. San Francisco, CA: Jossey-Bass.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology, 76*(4), 569-582.

Goodlad, J. I. (2004). *A Place Called School*. New York: McGraw-Hill.

Green, R. (2003). *Natural Forces: How to Significantly Increase Student Achievement in the Third Millenium*. Monticello, FL: Educational Services Consortium Inc.

Harrison-Jones, L. (2007). No Child Left Behind and implications for Black students. *The Journal of Negro Education, 73*(3), 346-356.

Heller, D. A. (Ed.). (2004). *Teachers Wanted: Attracting and Retaining Good Teachers*. Alexandria, VA: Association for Supervision and Curriculum Development.

Hess, F. M., & Finn Jr., C. E. (Eds.). (2007). *No Remedy Left Behind: Lessons from a Half-decade of NCLB*. Washington DC: The AEI Press.

Ingersoll, R. M. (2002). The teacher shortage: A case of wrong diagnosis and wrong prescription. *NASSP Bulletin, 86*(631), 16 - 31.

Ingersoll, R. M. (2003a). Is there a shortage among mathematics and science teachers? *Science Educator, 12*(1), 1 - 9.

Ingersoll, R. M. (2003b). *Who Controls Teacher's Work? Power and Accountability in America's Schools*. Cambridge, MA: Harvard Universtiy Press.

Jacobs, H. H. (Ed.). (2010). *Curriculum 21: Essential Education for a Changing World.* Alexandria, VA: ASCD.

Johnson, S. M. (2011). Two generations of teachers meet in the schools. In D. Drury & J. Baer (Eds.), *The American Public School Teacher: Present, Past, & Future* (pp. 143 - 153). Cambridge, MA: Harvard Edcation Press.

Jupp, B. (2011). What are teachers in it for? In D. Drury & J. Baer (Eds.), *The American Public School Teacher: Past, Present, & Future* (pp. 155 - 164). Cambridge, MA: Harvard Education Press.

Killion, J., & Harrison, C. (2006). *Taking the Lead: New Roles for Teachers and School-based Coaches*. Oxford, OH: National Staff Development Council.

Killion, J., & Hirsh, S. (2011). The elements of effective teaching. *Journal of Staff Development, 32*(6), 10 - 12, 14, 16.

Krajcik, J. (2013). The next generation science standards: A focus on physical science. *The Science Teacher, 80*(3), 27-35.

Kurz, T. B., & Knight, S. L. (2004). An exploration of the relationship among teacher efficacy, collective teacher efficacy, and goal consensus. *Learning Environments Research, 7*, 111 - 128.

Lawrence - Lightfoot, S. (1983). *The Good High School: Portraits of Character and Culture*. United States of America: Basic Books.

Lawrence - Lightfoot, S. (1994). *I've Known Rivers: Lives of Loss and Liberation*. Reading, Massachussetts: Addison - Wesley Publishing Company.

Lawrence - Lightfoot, S., & Hoffman Davis, J. (1997). *The Art and Science of Portraiture*. San Francisco: Jossey - Bass Publishers.

Levy, A. J., Pasquale, M. M., & Marco, L. (2008). Models of providing sciece instruction in the elementary grades: A research agenda to inform decision makers. *Science Educator, 17*(2), 1-18.

Lowe, J. M. (2006). Rural education: Attracting and retaining teachers in small schools. *The Rural Educator, 27*(2), 28-32.

Mangrubang, F. R. (2005). Issues and trends in science education: The shortage of qualified science teachers. *American Annals of the Deaf, 150*(1), 42 - 46.

Maxwell, J. A. (2005). *Qualitative Research Design* (Vol. 41). Thousand Oaks: Sage Publications.

McLaren, P. (1989). *Life in Schools: An Introduction to Critical Pedagogy in the Foundations of Education*. New York: Longman.

Miles, M. B., & Huberman, M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook* (2nd ed.). Thousand Oaks: SAGE Publications, Inc.

Miller, K. W., & Davison, D. M. (2006). What makes a secondary school science and/or mathematics teacher "highly qualified?". *Science Educator, 15*(1), 56 - 59.

Mizell, J. A. (1999). *The Adoption of the Georgia Quality Core Curriculum: A Historical Analysis of Curriculum Change.* University of Georgia. Retrieved from

http://search.proquest.com/docview/304501205?accountid=14800 ProQuest Dissertations & Theses (PQDT) database.

Moore Johnson, S. (1990). *Teachers at Work: Achieving Success in our Schools*. New York: Basic Books, Inc.

Moustakas, C. (1994). *Phenomenological Research Methods*. Thousand Oaks: Sage Publications.

National Research Council (Ed.). (2001a). *Inquiry and the National Science Education Standards*. Washington, D. C. : National Academy Press.

National Research Council (Ed.). (2001b). *National Science Education Standards*. Washington D.C.: National Academy Press.

Nelson, G. D., & Landel, C. C. (2006). A collaborative approach for elementary science. *Educational Leadership, 64*(4), 72-75.

Patton, M. Q. (2002). *Qualtitative Research and Evaluation Methods* (3 ed.). Thousand Oaks: Sage Publications.

Ravitch, D. (2001). *Left back: A Century of Battles Over School Reform*. New York: Simon & Schuster.

Ravitch, D. (2010). *The Death and Life of the Great American School System: How Testing and Choice are Undermining Education*. New York: Basic Books.

Ross, J., & Bruce, C. (2007). Professional development effects on teacher efficacy: Results of randomized field trial. *The Journal of Educational Research, 101*(1), 50-60.

Rothman, R. (2013). Putting the pieces in place. *Educational Leadership, 70*(4), 18 - 22.

Sarason, S. B. (1996). *REVISITING "The Culture of the School and the Problem of Change"*. New York: Teachers College Press.

Seidman, I. (2006). *Interviewing as Qualitative Research* (3rd ed.). New York: Teachers College Press.

Shanahan, T. (2013). The common core ate my baby and other urban legends. *Educational Leadership, 70*(4), 10 - 16.

Shen, J., Gerard, L., & Bowyer, J. (2010). Getting from here to there: The roles of policy makers and principals in increasing science teacher quality. *Journal of Science Teacher Education, 21*, 283 - 307.

Smith, M., & McLaren, P. (2010). Critical pedagogy: An overview. *Childhood Education, 86*(5), 332-334.

Spillane, J. P. (2004). *Standards Deviation: How Schools Misunderstand Education Policy*. Cambridge, Massachusetts: Harvard University Press.

Stake, R. E. (2000). Qualitative Case Studies. In N. K. Denzon & Y. S. Lincoln (Eds.), *The Sage Handbool of Qualitative Research* (pp. 443-466). Thousand Oaks: Sage Publications

Szal, D. M. (2010). The relationship of administrative behaviors and characteristics with teachers' general and personal efficacy. *National Social Science Journal, 35*(1), 145-152.

The National Commission on Excellence in Education (1984). *A Nation at Risk: The Full Account*. Westford, MA: Courier Companies, Inc.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*(2), 202-248

Tucker, M. S., & Codding, J. B. (1998). *Standards for our Schools: How to Set Them, Measure Them, and Reach Them.* San Francisco: Jossey-Bass Publishers.

Tyack, D., & Cuban, L. (1996). *Tinkering Toward Utopia: A Century of Public School Reform*. Cambridge, Massachusetts: Harvard University Press.

Valencia, R. R. (2010). *Dismantling Contemporary Deficit Thinking: Educational Thought and Practice*. New York: Routledge.

Van Roekel, D. (2011). Laying the groundwork for teacher success. In D. Drury & J. Baer (Eds.), *The American Public School Teacher: Past, Present, & Future* (pp. 207 - 217). Cambridge, MA: Harvard Education Press.

Watlington, E. J., Shockley, R., Earley, D. L., Huie, K. K., Morris, J. D., & Lieberman, M. (2004). Variables associated with teacher retention: A multi-year study. *The Teacher Educator, 40*(1), 56 - 66.

Weller, D. L., & Weller, S. J. (1998). Raising test scores through the continuous improvement model. *The Clearing House, 71*(3), 159 - 164.

Whitaker, T. (2004). *What Great Teachers Do Differently: Fourteen Things that Matter Most*. Larchmont, NY: Eye on Education.

Whitaker, T., Whitaker, B., & Lumpa, D. (2009). *Motivating & Inspiring Teachers: The Educational Leaders Guide for Building Staff Morale* (2nd ed.). Larchmont, NY: Eye on Education.

Yeung, K. W., & Watkins, D. (2000). Hong Kong student teachers' personal construction of teaching efficacy [1]. *Educational Psychology, 20*(2), 213 - 235.

Yin, R. K. (Ed.). (2009). *Case study Research: Design and Methods* (4 ed. Vol. 5). Washington DC: Sage.

Yost, D. S. (2006). Reflection and self-efficacy: Enhancing the retention of qualified teachers from a teacher education perspective. *Teacher Education Quarterly, 33*(4), 59-76.

Young, V. M. (2012). *The Crucial Voice of the People: Past and Present* (2nd ed.). Lanham, Maryland: R & L Education.

Zemelman, S., Daniels, H., & Hyde, A. (2012). *Best Practice: Bringing Standards to Life in America's Classrooms*. Portsmouth, NH: Heinemann.

APPENDIX A:

Formal Interview Protocol Questions

Interview One Questions – Life History

1. Can you give me a description of your career as an educator?

a. What were some of the events that led you to teaching as a career?

b. What have been some of your greatest satisfactions while teaching?

c. What have been some of your greatest disappointments while teaching?

d. What events or situations have left you feeling overwhelmed during your career? What made you stay in the profession when times became overwhelming?

e. When have you felt as if you were empowered as a teacher?

f. When have you felt as if your autonomy and control been taken away by others?

g. Please describe the administrators that you have worked with / for and attempt to define their role in implementing school reforms and changes.

h. Since *A Nation at Risk* was published, schools have undergone numerous changes and reforms. What do you remember about your work life during the eighties as a result of school reforms and changes?

i. It can be said, that you have had a tremendous career to survive the numerous changes associated with school reforms and school improvement. What have been some of the secrets to your success in teaching?

j. Before we close for today, I would like for you to reflect on the numerous reforms and changes that have taken place over your career. What were these reforms, and how do you think they affected you and your teaching methods? Did these reforms change you or your methods?

Interview Two Questions – Effects of School Reforms

2. As a science teacher, you have experienced numerous reforms and changes over your career.

a. What have been your experiences with school reform since the publication of *A Nation at Risk*?

b. During the mid-eighties, the state of Georgia implemented the QCCs. How did the new curriculum affect your teaching? Did you find the QCC to be effective?

c. What were some of the initiatives and policies that affected your teaching style and beliefs as a science teacher?

d. During the mid-nineties, the Benchmarks for Science Education were published that led to an increase in the use of "inquiry based" teaching strategies. Do you remember changing any teaching methods or activities as a result of the Benchmarks for Science Education?

e. How did the implementation of the GHSGT in Science change the way that you taught? Did you change any of your teaching methods or activities because of the GHSGT?

f. What effect did the GHSGT have on science education in your school? Did your school administration change any policies because of the GHSGT? What were some of the policy changes or actions?

g. During the nineties, what were some of the effects of the educational change movement in Georgia? What do you remember about the changes in education during that time?

h. Around 2000, the A+ education reform act and NCLB were implemented almost simultaneously. What did these two legislative actions do to the field of education? What is your opinion of these two acts?

i. Because you have taught for greater than two decades, and you have experienced many of the educational reforms and changes, I want you to take a few moments to describe your beliefs regarding the school changes and reforms.

j. How have your students changed over the course of your career? Can you identify great periods of change in your students?

k. In your opinion, what has been the effect of NCLB on student achievement in science education? Have there been any benefits with regard to student learning? Have there been any negative effects because of NCLB?

l. With the implementation of the GPS and EOCT tests, can you identify any changes in your teaching style or the amount of pressure that you have felt to perform? What were these changes?

m. Finally, what do you know about the newest changes and school reforms that are now being implemented? What do you know about the newest school reforms?

Interview Three Questions

3. Interview three questions will result from an analysis, reflection, and preliminary interpretation of the transcriptions of the prior two interviews. The third interview is used to clarify, elaborate, and verify insights and preliminary themes generated from a preliminary analysis of transcripts from prior interviews.

APPENDIX B:

Informed Consent Form

Informed Consent

You are being asked to participate in a research project entitled "The experiences and perceptions of rural science teachers in Georgia with school reform since *A Nation at Risk,"* which is being conducted by Joshua Bryan, a graduate student at Valdosta State University. Your participation is voluntary. You may choose not to participate in the interviews at any time, or to skip any questions that you do not wish to answer. Your completion of the interviews serve as your voluntary agreement to participate in this research project.
The interview process will include a total of three interviews that shall each last for approximately one and a half hours. The interviews shall consist of questions regarding a) life history regarding teaching, b) details of the experience, and c) reflections on meaning.

Participants have been chosen for this study because of their years of teaching experience, and because they will provide rich data regarding the phenomenon of teaching science in rural south Georgia. All participants will choose a pseudonym, or have a pseudonym assigned to them for their anonymity. All interviews will be recorded using a digital voice recorder, and copies of the recording will be maintained on a password protected computer. All printed transcripts will be stored in a locked filing cabinet, and word processed transcripts will be saved on a password protected computer.

Questions regarding the purpose or procedures of the research should be directed to Joshua Bryan at (229) 560 – 3848 or jtbryan@valdosta.edu. This study has been exempted from Institutional Review Board (IRB) review in accordance with Federal regulations. The IRB, a university committee established by Federal law, is responsible for protecting the rights and welfare of research participants. If you have concerns or questions about your rights as a research participant, you may contact the IRB Administrator at 229- 259 -5045 or irb@valdosta.edu.

APPENDIX C:

Institutional Review Board Exemption Form

Institutional Review Board (IRB) for the Protection of Human Research Participants

PROTOCOL EXEMPTION REPORT

PROTOCOL NUMBER: **IRB-02879-2012** **INVESTIGATOR:** **Joshua Bryan**

PROJECT TITLE: **The Experiences and Perceptions of Rural Science Teachers in Georgia with school reform since *A Nation at Risk***

INSTITUTIONAL REVIEW BOARD DETERMINATION:

This research protocol is **exempt** from Institutional Review Board oversight under Exemption Category(ies) 2. You may begin your study immediately. If the nature of the research project changes such that exemption criteria may no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research.

ADDITIONAL COMMENTS/SUGGESTIONS:

Although not a requirement for exemption, the following suggestions are offered by the IRB Administrator to enhance the protection of participants and/or strengthen the research proposal:

☐ If this box is checked, please submit any documents you revise to the IRB Administrator at irb@valdosta.edu to ensure an updated record of your exemption.

Barbara Gray 10/24/12

Thank you for submitting an IRB application.

Barbara H. Gray, IRB Administrator Date ***Please direct questions to irb@valdosta.edu or 229-259-5045.***

Revised: 08.02.2012