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Selected High School Science Teachers' Perceptions Regarding Adaptations to Their Instructional Practice Due to the Implimentation of State Required End of Course Exams in a Midsized Central Florida School District

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SELECTED HIGH SCHOOL SCIENCE TEACHERS' PERCEPTIONS REGARDING

ADAPTATIONS TO THEIR INSTRUCTIONAL PRACTICE DUE TO THE

IMPLIMENTATION OF STATE REQURIED END OF COURSE EXAMS IN A MIDSIZED

CENTRAL FLORIDA SCHOOL DISTRICT

BY

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DEDICATION

I would like to like to dedicate this to my parents, Tom and Eileen Keller, for all of their love,

understanding and support through the doctoral process.

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Abstract

Science teachers have a unique place in education due to their academic discipline and the fact that the public ties teacher accountability to student performance. One major measure of teacher accountability in the State of Florida is the end of course examinations (EOC). The purpose of this study was to examine selected high school Biology teachers' perceptions about how their instructional practices have been affected by the administering of an EOC in comparison to other high school science teachers who are not required to administer an EOC. The overriding research question for this study was: What are the perceptions of selected high school science teachers whose students are subject to an EOC, as well as those whose students are not subject to an EOC?   This qualitative study used a grounded theory, phenomenological approach to first elicit the perceptions of selected science teachers regarding how their instructional practices have been affected by the implementation of an EOC. These perceptions were examined within the context of other science teachers in the same school who were not subject to EOCs. Emergent understandings of these teachers' perceptions were then used to build a theoretical understanding of the phenomena surrounding their construction.

The sites for this research are science departments from high schools in a mid-sized central Florida school district. This research was accomplished by gathering data from preliminary surveys with open-ended responses, then followed up with more in-depth interviews constructed from the initial survey responses. Key findings from this study were the teachers' need to cope with the pressure of time constraints on their instruction and working within the curriculum map as mandated by the county offices. Additionally, results of this study also indicated that teacher accountability and the pressures it engenders to increase student achievement are more pronounced for those teachers administering EOCs, who subsequently

believe student learning is diminished. Importantly, teachers of subjects that include EOCs in this study themselves expressed understandings that these accountability pressures distorted their teaching practices to focus more on less cognitively complex classroom learning activities such as fact-based questions than their non-EOC teacher counterparts, although they knew these approaches to be less effective. Although this phenomenon of the unintended consequences of EOCs has been explored before, this study highlighted it from the vantage of teachers who were aware of its occurrence, but felt powerless to stop it.

Chapter 1

Background

Teachers today face a unique issue in their profession; that is, there has been a shift to less freedom to choose the material that they teach in the classroom (Vassallo, 2013; Wintrol & Jerinic, 2013). In the past, teachers knew the subject that they had to teach but had a certain amount of input over what material was taught in the classroom, along with the choice of time that they wanted to spend on a particular subject (Caroline, Huan-Frank, & Kimmel, 2010; Ogan-Baekiroglu & Akkoc, 2009). All states have curriculum standards that guide instruction. Standards, as defined by Ormrod (2006), are "general statements regarding the knowledge and skills that students should gain and the characteristics that their accomplishments should reflect" (p. 436). The issue is that the current environment of high-stakes testing and hyper-accountability has sometimes driven the use of content standards outlining what is and what is not to be taught in the classroom, moving beyond anchoring teaching practices and curriculum to constraining them (Cook, Galye, & Rogers, 2012).

Linked to the issue of the curricular content of a required course is the development or administration of a final assessment. In the State of Florida, Biology teachers are required to administer an End of Course Exam (EOC). For students, passing the Biology EOC is one of the requirements for passing the course. EOCs are defined as exams that are administered at the end of an academic course, and they are designed to meet a minimal competency level in a class in which a passing grade is required to pass the course (Bishop, 2001). This requirement of a passing grade in order to pass the class and earn credit for it puts this EOC, and the state system in which it is nested, into the realm of what many refer to as "high stakes" testing. Ysseldyke, Nelson, and Christenson (2004) have elaborated on this point, writing that "State systems are

considered high stakes when consequences to individual students (e.g., grade retention/promotion or withholding diplomas) are evident" (p. 76). These and other EOCs became more commonplace after the signing and implementation of the No Child Left Behind Act (NCLB). According to Neher and Plourde (2014), NCLB placed accountability for student education on schools, but also directly on the teachers. While it is true that all public school teachers, not just those administering an End of Course (EOC) exam, are expected to tie their curriculum to standards, teachers who must administer an EOC have additional pressures compared to those not required to administer an EOC.

Statement of the Problem

High-stakes testing has an impact on many high school science teachers, and in the context of this study, biology teachers, who are required to administer an EOC (FDOE, 2015). There are unintended consequences associated with high-stakes testing and the implementation of EOCs. For instance, some have found that teachers felt heightened pressure and competition, which reduced morale and collaboration and encouraged cheating or teaching to the test in an attempt to raise scores (Collins, 2014). Further, in response to the standards, some school districts have used particular models that incorporate a learning schedule in which time limits for teaching content are imposed and a time frame is set for when particular topics are to be covered. Teachers are required to adhere to the model (Timar, 2005). When the test is administered also affects the learning schedule. For example, one such EOC proficiency test was known as the Florida Comprehensive Assessment Test (FCAT). The state of Florida has increasingly pushed the administration of the FCAT, FCAT 2.0, and subsequent versions (Jones & Egley, 2009; Vernaza, 2012) earlier in the school year, thus compressing the timeline even further while impacting classroom pedagogy and curriculum even more significantly.

The underlying purpose for administering EOCs is twofold. EOCs have been claimed to increase student achievement and to act as a guide for both teachers and schools (Shuster, 2012). EOCs also provide an analytic tool for school districts to assign the distribution of rewards and consequences to succeeding and failing schools, to teachers (performance pay), and to students (Shuster, 2012). In addition, EOCs are believed to contribute to increased academic rigor for students by leveraging the measure as a motivation for teachers to focus on the curriculum they assess.

However, regardless of the seemingly beneficial purposes of the EOCs, many in and out of the classroom have leveled strong criticism at these exams. Some claim they have negative impacts on students, teachers, and learning. For instance, in the event that a teacher needs to spend additional time on the given material for the students to gain full comprehension of the material, often teachers believe they cannot set aside the learning schedule in order to accommodate these needs (Bear, 2012). Compliance with these learning schedules requires that certain content is taught on specific days within the school year (Yau, Joy, & Dickert, 2010). Subsequently, little time is allotted for either moving faster in instruction or reviewing material in order to ensure that critical concepts are understood by students before moving on with the curriculum. Likewise, a learning schedule also discourages teachers from moving on to a different subject if the students have mastered the material that was presented to them. As a result of learning schedules, many teachers feel constricted in their pedagogical practice, arguing that these expectations of teaching and learning practices placed on teachers by state and federal legislatures further complicate their relationship with learning schedules and the public policymakers and legislation that have created the conditions for them to arise. Teacher feelings that their professional practices are constricted by outside forces with whom they have little input

or influence has the potential to lead to workplace frustration in an already challenging career (Veletsianos, Kimmons, & French, 2013). Add to those frustrations frequent revisions of curricular standards, accompanying shifts in the material and time allotted for instruction, and the lack of job security for many teachers and the disaffection and frustrations of teachers are compounded. Last, while national and state standards place the majority of responsibility on teachers, the development and formation of these assessments rarely involve them and, in fact, seldom are they even asked for their feedback considering their development, implementation, or impacts (Masuda, Ebersole, & Barrett, 2013). This lack of teacher voice regarding the ubiquitous presence of EOCs represents a missed opportunity as well as an amplifier of teacher frustrations.

Given the lack of teacher voice and agency regarding EOCs, one question is how are teachers coping with administering high-stakes tests such as the EOC and how do they impact their practices? The EOCs bring with them added pressures, but how do teachers construct meaning regarding how the surrounding issues affect them and their teaching? Public school teachers in Florida face time constraints when teaching material and content areas that have accompanying EOCs, and these time constraints created by pacing schedules potentially change their teaching styles, create performance pay issues, and affect student success rates. This may result when school districts impose and require learning schedules for classes with EOCs and, given the relatively rapid changes to EOCs, some of these learning schedules may not even fully incorporate all of the required curricular content represented by their accompanying state standards, an issue sometimes further inflamed by the timing of high-stakes tests in the state of Florida.

High-stakes tests like EOCs in the state of Florida are but one means of measuring student achievement and contributing to teacher and school accountability. However, many

teachers feel that the primary use of such high-stakes tests is to be a mechanism of teacher accountability. With these high-stakes tests like the Florida EOCs, student achievement is a major measure of teacher accountability. This is especially true of biology teachers in Florida who administer their EOCs, unlike other high school science teachers, who do not administer EOCs. Figure 1 below illustrates some main issues that surround science teachers whose courses are accompanied by expectations to administer EOCs. These teachers have the increased pressure that comes from conceptualizing student success almost exclusively through the lens of one high-stakes assessment, as well as the constraints that are brought about when teaching has to occur within a timeframe in such a way that they might potentially change their teaching styles and practices in order to meet these accountability demands.
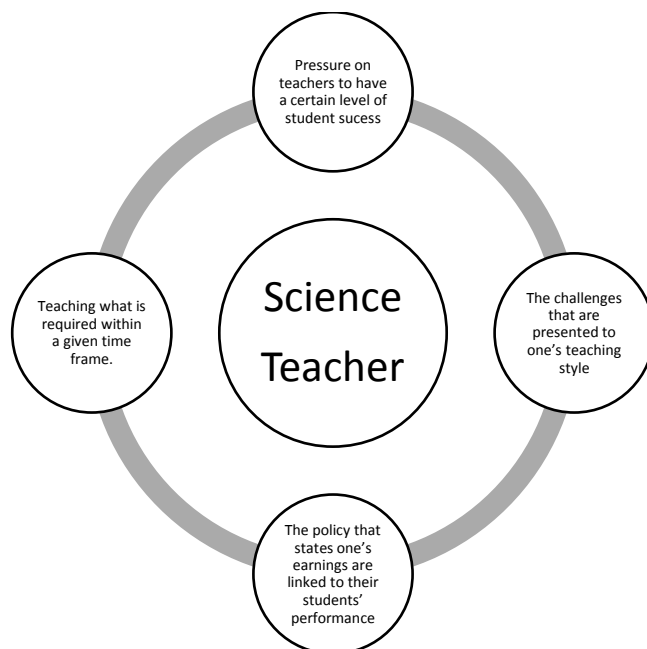
Figure 1. Issues that surround the science teacher arising from implementing EOCs.

Purpose

The purpose of this study is to examine whether selected high school Biology teachers perceive that their instructional practices have been affected by the implementation of an EOC,

while paying particular attention to the perspectives these teachers hold in comparison to their high school science teacher peers who are not required to administer EOCs.

Research Question

The overriding research question for this study was: What are the perceptions of selected high school science teachers whose students are subject to an EOC, as well as those whose students are not subject to an EOC?

The related specific research questions are:

1. What are the science teachers' perceptions about how the presence or absence of an EOC affects their instructional classroom practices?

2. What are the science teachers' perceptions about adaptations to their instructional practices, if any, in areas such as pacing of instruction, assignments (artifacts such as quizzes, labs or other assignments), curriculum maps or other instituted practices?

Significance of the Study

This study has several areas of significance. It will add to the body of knowledge that already exists regarding how EOCs affect teacher attitudes and pedagogical practices such as their development of learning tasks or assignments, as well as the pace at which they teach. While there have been other studies concerning EOCs and their impacts in other states that administer them, this study will contribute by exploring this phenomenon in the state of Florida. Additionally, although teachers are often told that they are the most important part of education, they often have little control over the academic process (Beachman & Rouse, 2012). In recognition of this loss of teacher voice, this study was designed to provide teachers space to share their experiences in implementing EOCs. Not only is this important to gain insight into a teacher's experience, but some argue that "the people closest to the issues are best situated to

discover answers" (Guajardo, Guajardo, Janson, & Militello, 2016, p. 25). This study could be informative for policy makers, as it may demonstrate the perceptions of teachers around EOCs and how they believe their presence impacts their teaching. In this way, policy makers can hear more from teachers regarding the impacts of their policies on instructional practices and thus this study potentially provides a basis for policy reform that is informed by essential end-users, teachers themselves. Finally, the study could be beneficial to teacher practice, as other teachers who read it may learn more about how to cope with pedagogical constraints to their own instructional practices as a result of EOCs. In either case, the methodological approach of this study, and its positioning of teachers at the forefront of the educational processes, should serve as another model for research as a vehicle for participant agency and voice.

Definition of Terms and Acronyms

As with many studies, particularly those exploring educational phenomena and the jargon-laden landscape it occupies, it will be helpful for the purposes of this research if some terms are clarified through operational definitions. Below is a list of such words, terms, and constructs:

- **Biology EOC**: Exams that are administered at the end of an academic course (Biology) and are designed to assess a minimal competency level in a class in which a passing grade is required to pass the course (Bishop, 2001; FDOE, 2015).

- **Change Theory**: "A three-stage model of change that is known as the *unfreezing-change-refreeze model* that requires prior learning to be rejected and replaced, as defined by Kurt Lewin in 1947" (Burnes, 2004, p. 999).

- **Curriculum Map**: Curriculum mapping is a system that thematically aligns assessment, curriculum, and instruction (Joyner, 2016).

- **Direct Instruction**: When students are given information about a particular subject from a teacher and then the students are required to retain that information for future uses, i.e., tests or any other types of assessment (Hushman and Marley, 2015).

- **EOC, EOC**: A high-stakes test used as an accountability measure to ensure college and career readiness under *NCBL* mandates (Mueller, 2015).

- **FCAT 2.0**: Florida Comprehensive Assessment Test version 2.0, administered in fifth and eighth grade science classes, based on the NGSSS.

- **FSA: Florida Standards Assessment (FDOE, 2014)**: The (Florida) statewide standardized test of student performance on state standards in Language Arts and mathematics, based on the LAFS and MAFS in grades 3 through 8 (Drumm, 2015). Algebra 1, Algebra 2, and Geometry EOCs are also administered as part of the FSA.

- **Guided Inquiry**: Guided inquiry is defined as "consisting of the ways in which the world is studied and explained based on the evidence of scientists in reference to an active learning process that engages students so that students will then start to understand the scientific ideas and procedures used in doing science" (Nivalainen, Asikainen, & Hirvonen, 2013, p. 452).

- **High-Stakes Test**: "Tests used as a High School Diploma requirement" (Au, 2007, p. 260).

- **Inquiry Learning**: Student inquiry learning involves several areas of learning: students scrutinize and assess a problem or issue and then analyze and solve the problem or issue, showing all of the steps involved and finalizing it in a report with accompanying references (Walker, 2014).

- **Instructional practices**: The application, design and delivery of educational material based on proven and approved curricula that is important for students to achieve desired outcomes (IBS, 2009).

- **Language Arts Florida Standards (LAFS)**: Language Arts educational standards in the state of Florida (Ujifusa, 2014). Example- LAFS.1112.SL.2.6: Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate (FDOE, 2014).

- Mathematics Florida Standards **(MAFS)**: mathematics standards in the state of Florida (Ujifusa, 2014). Example- MAFS.912.G-GMD.1.3: Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems (FDOE, 2014).

- **No Child Left Behind (NCLB)**: mandates that every child from Grades Three through Eight is to be tested yearly in reading and mathematics and once in elementary, middle, and high school in science using state assessments. Decisions on how to reform schools will be made by the states, and low performing schools will receive help to improve. Finally, students in persistently dangerous schools or low performing schools will have the option to transfer (Ravitch, 2010).

- **Next Generation Science Standards (NGSS):** National Science Standards put forth based on the "four foundational ideas of presenting performance expectations for all students, describing policies, not curriculums, clarifying equity and excellence, integrating engineering with science and providing guidance for college and career readiness" (Bybee, 2013, p. 3).

- **Next Generation Sunshine State Standards (NGSSS)**: broad statements that describe the knowledge or ability that a student in Florida should be able to demonstrate by the end of every grade level from first through twelfth grades (FDOE, 2014).

- **National Science Education Standards (NSES):** The National Science Education Standards are a national set of guidelines that were developed for primary and secondary schools in the United States and led by the National Research Council in 1996 (Yeager, 2005).

- **Pacing Guide**: Created by school district leaders to help teachers stay on track and to ensure curricular continuity across schools in the district; serving a purpose similar to that of traditional scope-and-sequence documents, which lay out expectations of the material to be covered in each subject at each grade level formulated to meet benchmark assessments and can specify the number of days, class periods, or even minutes that teachers should devote to each topic (David, 2008).

- **Race to the Top (RttT):** an initiative that has a shared 4.3 billion dollar stimulus for states either to reward high performing teachers or teachers whose students show the most achievement or highest scores, or to penalize teachers based on the low achievement and low scores of their students (Ravitch, 2010).

- **SLAM**: Sentence, Line, Answer, Mechanics; A writing strategy which is a guided step by step process (Dumas-Landis & Honigsfeld, 2010).

- **Sunshine State Standards (SSS)**: predecessor to the NGSSS (FDOE, 1996); broad statements that describe the knowledge or ability that a student should be able to demonstrate by the end of every grade level from first through twelfth grades.

Scope of the Study

The study examined the perceptions of selected science teachers' perceptions pertaining to whether their instructional practices have been affected by the EOC. This research took place at three high schools which at the time of this study were ascribed grades of either "B" or "C" in the Florida state assessment system. These schools were also selected because they were very similar to each other as far as student population and demographics. It must, however, be stated that there were limits to looking only at B/C schools. A further rationale for the selection criteria for the schools and teachers in this study will be explained in greater detail in the Methodology section under "Site Selection."

Organization of this dissertation

This dissertation will be organized in five chapters. Each chapter will have a distinct focal point, along with having distinct subsections within that chapter. The introduction, literature review and methodology will tie in to how this research was conducted. The descriptions of this qualitative study will describe why grounded theory and a phenomenological approach were used.

The first chapter is an introduction to this research. In this section some general background material is provided to the reader. Also included in this chapter are the purposes of this study, along with the research questions. A list of terms and acronyms used throughout the paper, with definitions, is also found in this first chapter. At the end of this chapter is the detailed scope of this study as well as the overview of this study.

The second chapter is the literature review. The literature review is divided into several areas: introduction, a section on change theory, the educational leader to support adaptation to change, Federal, State, and Local policies and initiatives that influence science teacher practice

assessment, science teacher instructional practices, assessment in science education, perceptions of teachers that administer EOCs, and finally a conclusion.

More specifically, the section on change theory delves into the basic concept of change theory including restraining and driving forces along with achieving equilibrium. The next section of the literature review includes how this research ties into educational leadership by looking at the viewpoints, from a teacher's perception of leadership and a school leader's perception of leadership. It is also important to research the driving forces and history of change through researching Federal, state and local policies and initiatives. At the Federal level research on three major policies and reports--A *Nation at Risk* (1983), *No Child Left Behind* (2001), and *Race to the Top* (2009)--is reviewed. The role of national standards documents like the National Science Education Standards and the Next Generation Science Standards is discussed. Finally, the impact of state policies and implementations like Florida's Next Generation Sunshine State Standards are described. From this point the focus changes to the roles and perception of the teacher. Two particular methods of science instruction, namely direct instruction and inquiry learning, are discussed. This is followed by a discussion of the assessment methods teachers use in science. Current trends that influence methods of assessment as well as the dominance of EOCs are described, with a focus on how EOCs influence the ways teachers assess students as well as the use of EOC data for both student learning and as a measure of teacher effectiveness. The last part of this section about assessments contains the critiques, both positive and negative, of the EOC. Finally, the chapter concludes with a discussion of research on the perceptions of teachers that administer an EOC, why those perceptions are important, how one's perceptions influence their teaching practice, teacher perceptions on the EOC, and the impact EOCs have on teaching practices. The conclusion of this section includes restatements that education is always

changing, with one of the ideas of change coming from the type of assessment, the use of change theory at the teacher and leadership levels, the fact that teacher perceptions can be the driving or restraining force behind changes, and the notion that teachers' perceptions on the impact of EOCs influence instructional practices.

The third chapter opens with an explanation of qualitative research, then moves to the specifics of a phenomenological study and the rationale behind this specific choice of methodological approach. Chapter three also explains why Grounded Theory was chosen as the conceptual framework applied for this study.

Detailed descriptions of the methods and the instrument used to perform this study are included. A questionnaire provided basic demographic information and gave the researcher preliminary data, which was used in a standalone fashion as well as to build more detailed questions for individual, in-depth interview questions. Interviews were used to gather rich information from the selected science teachers that gave insight into their own perspectives on administering an EOC. Interview data also provided information from other teachers about their experiences in a classroom setting that does not have a required EOC. Artifacts from teachers were gathered to see if there was any difference in assessments between teachers who administered an EOC versus teachers that were not required to administer an EOC. Information about site and participant selection is included. Chapter three also includes a description of how information was given to the participants and how information obtained from the participants was collected and analyzed. A brief explanation of the role of the research was included in this section as well.

The fourth chapter is the results chapter, with four parts. The first section includes specific demographic data from the participants, their classes, and some demographic

information about their students. The next section covers questions from both the surveys and interviews pertaining to the first research question. This section includes the statements given by the teachers for either the initial survey and/or the interviews. The next section covers questions from both the surveys and interviews pertaining to the second research question. In a similar fashion, this section includes the statements given by the teachers from either the initial surveys and/or the interviews. The final section of the results chapter is a description of the artifacts collected and how they were categorized into three different groups based on the assessment provided. The actual artifacts themselves are posted in Appendix G.

The fifth chapter is the discussion chapter. The first section draws out themes from the responses given by the teachers. The first themes originate from the data collected from the first research question from the surveys, interviews and possible artifacts. The themes are listed by topic and examples of direct responses of the participants are placed in that particular section, and connections are made to relevant research literature. Themes in the second section also originate from the data collected from surveys, interviews and possible artifacts from the second research question. The themes are listed by topic and examples of direct responses of the participants are placed in that particular section. Again, connections to relevant research literature are made.   The next section of the discussion is the policy implication section. In this section implications for educational policies as well as any possible educational policy changes are discussed. The chapter concludes with a summary of this research and provides closing statements.

Appendices and references used throughout this paper, as well as the author's *VITA,* are located after chapter five. There are seven appendices to this research which include the survey and interview questions (A), CITI certificate (B), consent form (C), UNF IRB letter (D), request

to conduct research and permission form (E), original copies of artifacts collected (F) and

excerpts from reflective journals (G). After the appendices is a list of the references cited

throughout this paper. The last section is the author's *VITA*, with his work experience, research

experience, education, professional memberships and certificates and a list of previous

publications.

Chapter 2:

Literature Review

The purpose of this study is to examine the perceptions of selected high school biology teachers about how their instructional practices have been affected by the implementation of an EOC in comparison to other high school science teachers who are not required to administer an EOC. This study employs Change Theory as the theoretical framework. In this context the role of the educational leader to support adaptation to change is explored from the standpoint of teachers' perceptions of the role of the educational leader, as well as the perceptions of leaders themselves.

Background information for this research is provided through a brief overview of historical policies from the *A Nation at Risk* report up to and including *Race to the Top*. Even though there are more historical policies set forth by various presidential administrations, *A Nation at Risk* (1983)*, No Child Left Behind* (2001)*,* and *Race to the Top* (2009) are the most recent and most relevant to this study. Provided are a brief overview of three different sets of academic standards: the National Science Education Standards (NSES), the Next Generation Science Standards (NGSS) and the Next Generation Sunshine State Standards (NGSSS). These sections will provide the reader with a background on both recent and historical policy as well as academic standards.

It is also important to review typical science teachers' instructional and assessment practices. The discussion of instructional practices focuses on direct instruction and inquiry learning. Two important issues in science assessment are the current trends in methods of assessments and the dominance of EOCs for assessing both student gains and teacher accountability. In studying current trends in assessment methods, we must consider the role of

EOCs in teachers' assessment methods. I discuss how EOCs are used as a source of data for both a measure of student learning and teacher effectiveness. I also discuss literature on the benefits and criticisms of EOCs. Finally I highlight research on the perceptions of teachers that administer EOCs. For this topic, it is necessary to look at why those perceptions are important as well as how teachers' perceptions influence their practice of teaching. It is also important to gain insight on teachers' perceptions of EOCs. Finally, it would be remiss not to mention the impact that the EOCs have on teaching practices.

Change Theory

Change Theory is "a three-stage model of change that is known as the *unfreezing-change-refreeze model* that requires prior learning to be rejected and replaced" (Burnes, 2004, p. 999). This is important to note due to the fact that the field of education is constantly evolving and changing. Change Theory is relevant to this research due to the fact that teachers have to change their past teaching practices in order to meet the new standards and have the means to test the students' knowledge and retention of scientific knowledge. Under Change Theory schools need to change their existing practice (unfreeze); change to the new policy, which may involve updated training, workshops and any other administrative tasks that need to take place; and then implement the practice of the new policy (refreeze). This affects instructional and assessment practices because it forces the teachers to unfreeze their initial practices, change based on the new policy, and implement the new practices.

Description and Changes. Change Theory is one of many behavioral theories that describe the process of change (Thackeray & Niger, 2000). Change Theory can trace its roots to Kurt Lewin's ideas in the mid-twentieth century (Burns, 2004). The main psychological principal behind Change Theory is that of cognitive reconstruction. Cognitive reconstruction

occurs in three different ways: semantic redefinition, cognitive broadening and new standards of judgment or evaluation (Schein, 1999). Change Theory has two mechanisms by which people can enact changes. One mechanism is that of learning through positive or defensive identification and the second mechanism is learning through trial and error (Schein, 1999). Throughout time, modifications have been made to Lewin's original work. For example, in 1958 Lippitt, Watson, and Westley extended Lewin's Three-Step Change Theory to seven steps (Kritsonis, 2005). Even with changes the theory has undergone through time, the focus remains on ceasing current behavior (unfreeze), reframing organizational processes (change), and implementing the new policies (re-freeze).

Restraining and Driving Forces and Equilibrium. Change Theory notes the importance of three factors: restraining forces, driving forces, and equilibrium. People tend toward situations that are stable, or have achieved equilibrium. In this case of equilibrium, both restraining and driving forces have been balanced and equilibrium has formed, leading to a more stable environment, that of being purely restrained or constantly driven. Most of human behavior is based upon quasi-stationary equilibrium supported by both driving and restraining forces (Schein, 1996). In physics, according to Newton's Laws of Motion, an outside force is needed to change the inertia of an object. Similarly, in the psychological realm, peoples' ideas and practices require an outside force to disturb equilibrium. Adding a driving force often leads to the emergence of a counterforce (restraining). Restraining forces make change difficult because they represent well-established group or organizational norms (Schein, 1996).

One can think of the restraining forces as the "present state," and the driving force as the "desired state." Under Change Theory, the present state is where the organization is and the desired state is what the organization hopes to accomplish by removing restraining forces and

controlling driving forces (Schein, 2002). One approach to implementing Change Theory is known as the Force Field Approach. With this approach, the driving forces are increased; often this has already started and continues while the restraining forces are decreased (Curry & Caplan, 2002). In combination these two forces, both increasing driving and lessening restraining will lead to a change in an organization (Curry & Caplan, 2002). When the driving force can no longer exceed and overtake the restraining force, equilibrium occurs.

Leader's Role within Change Theory. Organizational leaders can facilitate change through reward and/or coercion. The leader can use reward power to increase some aspect of those underneath them, in materialistic terms granting pay raises, while the coercive power leads to the detraction of an aspect, getting fired or receiving reduced pay for not meeting the needs of organization (French, Raven & Cartwright, 1959). The idea of reward and punishment is a very simplistic approach.

Change Theory has implications for leadership. Leaders must themselves clearly understand the need for change and then create a framework and forums for discussion while making the problem "blame-free" and the solution a shared responsibility (Wagner, 2001). Finally, leaders need to create time to assimilate and discuss different kinds of data (Wagner, 2001). With Change Theory and the unfreezing and refreezing of change the leader takes on the role of the change agent and must therefore manage the language, dialogue and the identity of the change or changes taking place (Weick & Quinn, 1999). The role of the leader under Change Theory is complex and varies depending on the circumstances of the organization.

How it Applies. Change Theory has a wide variety of applications for organizational improvement. The improvement of organizational aspects includes the definition of performance criteria, development of indicators and methods of assessment, practice visits to collect data

against indicators and finally, feedback to the practice (Rhydderch, Elwyn, Marshal & Grol, 2004). Another application of Change Theory is that of model building. In using and applying Change Theory one can develop and expand upon most models created to better suit either the individual or the organization (Freeman & Dolan, 2001).

Change Theory highlights the relationship between the organization and its ability to change to meet new circumstances. An important aspect of Change Theory is the idea of resistance to change. While looking at an organization it is often necessary to apply Change Theory to determine why restraining forces are in place, why the individuals in the organization have restraining forces to the changes the organization wants to implement and what driving forces have to be in place to reach equilibrium within the organization (Krovi, 1993). With the introduction of Change Theory into various organizations, employees and their organizations have changed so much so that at regular intervals continuing professional education (CPE) and human resource development (HRD) must foster the necessary change to address these ongoing needs (Dirkx, Gilley and Gilley, 2004)

Application to Education. Change Theory can be used to implement educational reforms within a school system. The application of a change in instructional practice is used to bridge the gap between the results shown from educational research and educational practices. Instructional change practices tend to slow at many institutions due to the inertia that such programs have, as well as a lag in putting the practices to work in order to lead to success (Finelli, Daly, & Richardson, 2014).

Change that happens in the Science classroom requires instructional changes on the part of teachers and changes in administrative practices by administrators. Certain changes need to be made with teachers and instructors, such as planning, application of learning strategies, and

the development of assessments (Fenwick, 2012). Instructional approaches associated with positive change include defining relevance and engagement, inquiry, differentiated instruction, collaborative work along with assigned assessments such as homework and classwork, and an integration of language literacy and science (Olivera, Wilcox, Angelis, Applebee, Amodeo, & Snyder, 2013). Administrative practices that facilitate change include establishing a nurturing climate of opportunity to succeed in science, offering professional development based on data and dialogue, engaging teachers in standards-based curriculum revision and alignment, and recruiting the right fit of teacher (Olivera et al., 2013). Changes would also have to occur in the areas of planning at the administrative level, along with teacher development strategies, research into best practices, and coordination with other schools at the school, district, state and national levels (Fenwick, 2012).There needs to be a culture of collaboration between teachers and administrators. The best practice of instructional change entails multiple levels of teachers and administrative cooperation that together form a school-wide system that is conducive to the students' performance (Olivera et al., 2013).

The Educational Leader to Support Adaptation to Change

Educational leaders have a pivotal role in the change process. Different leaders within the school system have different roles. Some educational leaders with the school system are the superintendent of schools and the school board administration. Individual schools have the principal, assistant and vice principals, department chairpersons and other members of the administration (Ross, Hall, & Resh, 2014). Educational leaders need to conceptualize pedagogy as larger than teaching strategies. Three end points are critical in order for a transformational leader to accomplish all of the encompassing ideas. The role of the educational leader is important due to the fact that the educational leader provides support and guidance for the

teachers. Educational leaders also represent the teachers under them, either positively or negatively. When thinking about the importance of the educational leader as a facilitator of positive change, one cannot forget educational leaders who hold more than merely formal administrator positions, such as the department chairperson and teachers who choose to take on informal leadership roles within their school and district.

It is important to see the leader as an active leader, striving for the best in the school, school system, or even the department of which they are a part. A leader who is seen by those underneath as "being," "knowing," and "doing" is necessary to ensure a sense of direction in leadership, with a focus of purpose, veering away from chaos (Rosch & Anthony, 2012). Leaders who facilitate positive change in schools are transformational leaders. A transformational leader is a person who "engages with others and creates a connection that raises the level of motivation and morality in both the leader and follower…attentive to the needs and motives of followers and tries to help followers reach their fullest potential" (Northouse, 2007). The term transformational leader implies major changes in the form, nature, function and/or potential of some phenomenon, and when applied to leadership, it specifies general ends to be pursued, although it is largely moot with respect to means (Thomas et al., 2013). Other adjectives have been used to describe transformational leaders including heroic, distributed, sustainable, and charismatic (Cherkowsky, 2012).

Transformational educational leaders typically engage in a wide range of leadership strategies. With the radical ideas of change that transformational leaders bring to the table, some individuals within an organization tend to be more cautious about radical changes in leadership practice (Wang, 2011). Leaders, including educational leaders, need to become aware of the situation that they are in, taking the existing local contexts and organizational culture into

account (Wang, 2011). A leader must know the context and the culture of the educational system as a basis for engaging in the kinds of practices that can be employed to facilitate change. Some strategies of facilitating change are setting direction, developing people, redesigning the organization, and managing the instructional program (Klar & Brewer, 2013). These strategies reflect both transformational and instructional leadership for positive change.

Educational leaders must help others adapt to changes. Administrators like principals, vice principals, deans, and department heads are central to implementing change (Thomas, Herring, Redmond, & Smaldino, 2013). Schools are moving away from teachers that are active to administrators who play a more active role in the school. Teachers have to be able to adapt to the changes presented to them, and they must be prepared to rethink, unlearn and relearn, change, revise, and adjust their own personal classroom styles to meet the challenges placed before them (Thomas et al., 2013). In other words, they must unfreeze, change and refreeze.

Change can be supported in schools by different means. The implementation of technology is one of many ways to help support change in schools. Technology can support changes in how teacher educators teach and how future teachers learn to teach that allow for the innovative new components that include content, pedagogy, and technology (Thomas et al., 2013). A solid understanding of how appropriate technologies can be utilized results in effective teaching in diverse settings (Thomas et al., 2013).

Another key area of helping teachers adapt to new instructional practices is through the identification and practical solving of problems. It is important to know that with each new policy that is enacted, there is a unique set of problems for which practical solutions need to be found. The critical role of leadership is making such changes that solve the concerns, which also have practical applications that first need to be considered (Thomas et al., 2013).

Transformational leaders facilitate positive change and enhance the individual and collective problem-solving capacities of organizational members, including capacities that are exercised in the identification of goals to be achieved (Thomas et al., 2013). The transformational educational leader needs to be able to delineate the problems that the organization faces and then, based upon research, determine the best practice to change to. In order to enact this transformative change in education, there must be a continuous interplay between educational research and educational practice (Matusovich, Paretti, McNair, & Hixson, 2014).

One final obstacle to having teachers adapt to new policies is overcoming prior practices. As in physics, the idea of objects, or in this case, people, having inertia is true. People in general are fairly resistant to change for a myriad of reasons. One of the many reasons overcoming the inertia of previous policies is difficult is a lack of involvement in the process of change. Lack of employees' involvement in change initiatives could lead employees to develop negative attitudes toward these changes which, at the same time, could negatively influence their commitment to the changes. Since commitment is known to be a highly important factor determining the success of a change initiative, exploring employees' involvement levels in changes occurring in educational organizations is thought to be significant for employees' commitment to changes (Toprak & Summak, 2014).

Findings in the literature demonstrate different approaches that leaders take in order to enact change. This is not only true of business organizations, but of educational systems as well. Wang (2011) demonstrated that an exposure to different perspectives appeared to expand participants' views. This is an important facet of educational leadership because it forces teachers and administrators to jointly come up with solutions to problems that might not have been discussed if the problem were worked on individually or as separate entities.

Leaders need to possess additional characteristics beyond basic qualities. In the school, besides administrative skills, strong leadership is critical to addressing the disparities in our educational system, as well as developing collaborative advocacy for enhancing the quality of academic studies for all students (Futrell, 2011). It takes more than just leadership skills to improve the quality of education for students. It is critical for leaders to be able to communicate with those below them in order to fully appreciate and to strive to improve the academic excellence of the schools. It is important for true educational leaders to explore the importance of emotions, to recognize the impact of ignoring the full human experience in organizations, to research from a strengths-based perspective, and to develop virtuous behaviors in and out of the classroom (Cherkowsky, 2012). By taking into account the 'human element' of leadership, a wide variety of possibilities in the realm of educational leadership opens up. Being able to build upon strengths of those around the leader is a key area that would elevate and more deeply develop individual strengths (Cherkowsky, 2012). The educational leaders, identifying those particular traits of individuals around themselves, can then build on such qualities. These descriptions of leadership qualities are important, for they are how we learn to identify and develop leadership practices for school improvement. It is important for educational leaders to continue to explore the concept of leadership in order to foster and sustain learning communities (Cherkowsky, 2012).

Teachers' Perception of Leadership Regarding Support for Teachers to Change. Teachers are cornerstones of the American educational system and often have varied opinions about a wide range of school-centered topics. One important opinion that teachers have is what they feel about leadership at their own school, the school's district, their state, all three or varying combinations of the three. One of the key underlying opinions that teachers have about

their principal, who often assumes and has the leadership role in their school, is important. The teachers' opinions and perceptions of their principal depend on the principal's instructional leadership behaviors, which can include how the principal deals with change. Perceptions of teachers within their respective schools can vary, in both magnitude and direction, depending on the principal's engagement in instructional leadership behaviors (Gurley, Anast-May, O'Neil, Lee, & Shores, 2015).

Teachers have mixed perceptions regarding autonomy in the school. Teachers feel that they have the most autonomy in the classroom, but give up that autonomy when it comes to making decisions that affect the school as a whole. Teachers feel that they have the most control over the day-to-day running of the classroom, but feel they have little say over discipline policy, school budget, performance standards, and content of professional development that tends to be handed down from either the principal or an administrator of the school or sometimes even the district (Yoshida & Strong, 2014). This is a near contradiction due to the fact that not only are teachers responsible for day-to-day classroom management, but the other aspects previously mentioned of discipline policy, school budget (and sometimes department budget), performance standards of both teachers and students and professional development affect teacher performances in the classroom.

Teachers often feel that they are placed between a rock and a hard place. This is due to the fact that teachers have to balance the academic needs of their students with the requirements set forth by the administration. This can lead to a conflict of interests and job dissatisfaction. Teachers have claimed that responsibilities and workload have increased due to standardized testing, coupled with disrespect from students, an abundance of paperwork, and the lack of support received from administrators both at the school and district levels, which leads to

increased stress in the classroom that has the effect of weakened morale and a lowering of commitment to their school (Thibodeaux, Labat, Lee & Labat, 2015). Perceptions of teachers about their principals and administrators vary. One important note that is a focal point of this particular research is that differences are present between teachers who administer high-stakes tests and those teachers who do not. Teacher perceptions varied based on the administering or non-administering of high-stakes tests, and they indicated that administrators place more pressure on state-measured subject area teachers than non-state measured subject area teachers (Thibodeaux, Labat, Lee & Labat, 2015).

In another study, the authors went into greater detail in defining teachers' perceptions of their principals or other administrators. Often in education, as in other specific work fields, there are perceived differing levels of leadership. In the workplace, in this specific case a public high school, there can be links of behavior between a teacher's perception and their work performance. This phenomenon is called perceptions–attitudes–behavior theory, which states that there is a strong link between perception, attitude, and behavior in the work environment (Shapira-Lishchinsky & Tsemach, 2014). One can look at teachers' perceptions of their leaders and create a similar chain of events. Organizational behavior research has focused on positive behaviors, such as "organizational citizenship behaviors", on negative behaviors, commonly labeled as "withdrawal behaviors," and on the relationship between them affecting either a positive internalized moral such as job satisfaction and high work performance or the negative, which leads to job dissatisfaction and low work performance (Shapira-Lishchinsky & Tsemach, 2014). The previously-mentioned principles come into play with teachers' perceptions of their educational leaders in the two mentioned ways, both positive and negative. Teachers who hold their leaders in low esteem for a variety of reasons tend to exhibit withdrawal behaviors such as

lateness, absenteeism and intent to leave, while those teachers that perceive their leaders in a positive manner tend to be motivated to improve job performance (Shapira-Lishchinsky & Tsemach, 2014).

Teachers often expect their principal to be a transformational leader rather than a manager. Teachers feel that school principals are expected to act as visionaries, or transformational leaders, for a school and community and have a preference for this kind of leader due to the fact that school leaders who exhibit a more transformational style of leadership have been associated with improved educational outcomes (Devine & Alger, 2011).

Leaders' Perception of Leadership and Support for Teachers to Change. When looking at change and how change affects people, it is important to study how the leaders of that particular organization view change and view their leadership style in relation to change. In particular, the focus of this study is within the educational system, so it is important to look at perceptions of principals as well as the previously mentioned teachers' perceptions of leadership. One important facet of how principals and other educational leaders view themselves is that they feel that as principals, they are in the same situation as teachers. Due to recent accountability standards and measurements in public schools, principals sense that student gains in their school have a direct impact on the principals themselves (Hvidston, Range, McKim, & Mette, 2015).

Leadership roles are not limited only to school principals, but extend to other educational leaders with in a school district. Educational leaders in a school district have certain performance-based pressures. The pressures of leadership at the district level are different from those of the principal and of the teacher. For the district administrator the pressures of change come from building instructional leadership, building capacity and policy coherence (Derrington, 2014).

All leaders have different perceptions of their own leadership style. This can be true when talking about the individual teachers in their classroom, department chairpersons, assistant principals and administrators, principals and administrators of a school district up to and including the superintendent of schools for that district. There is no one type of principal, and the type of principal is dependent on the school and school system. Leadership styles vary in practice, and the differences between types of principals can be defined by the degree of principal and teacher leadership as well as other variables such as school size, urbanicity, accountability performance, and principal background (Urick & Bowers, 2014). Based on the school, it has been shown in one particular research study by Urick and Bowers (2014) that three types of principals emerge. As mentioned previously, depending on the school, the principals have defined their own leadership style as controlling, shared, or integrating (Urick & Bowers, 2014).

The role of principal has its own unique stressors. From the outside, due to their position, principals are often first seen as leaders of their school; therefore, they are responsible for what happens within the walls of the school. This is due to both the teacher's role in the school and the principal's role in the school, but the principal has other considerations in running his or her school. Principalship is a complex practice that involves managing and having responsibility toward poor performing students, managing finite resources, making personnel decisions, and working with a given curriculum (Augustine-Shaw, 2015).

Adding high-stakes testing to schools across the United States has changed principals' perceptions on leadership. The high-stakes testing has led in part to the accountability movement that will be discussed later in this literature review. The accountability movement has affected principals' attitudes toward and perceptions of their own leadership in their schools.

With the passing of the No Child Left Behind Act, the principal has received a great deal of attention in the public eye, This is largely a result of the intense desire on the part of the public to understand the interaction of leadership and school effectiveness that has grown from listening sensitively to parents, evaluating teachers, and exercising and staying within the limitations of the school budget despite increased demands by school officials continue to enhance school programs (Mosley, Boscardin, & Wells, 2014).

Federal, State, and Local Policies and Initiatives that Influence Science Teacher Practice

Federal, state and local policies are driving forces that have influenced the instructional practices of science teachers. At the federal level it is important to note that educational policies have been set forth by the federal government for over one hundred years. The historical perspective is important, but policies that are the main driving forces for changes in instructional practice in science are fairly recent. Federal policies within the past 33 years that are of relevance to this research are discussed below, along with state and local policies specific to the state of Florida, where this research was conducted.

A Nation at Risk. Change in educational policy became evident with the publication in 1983 of a report called *A Nation at Risk.* This report highlighted a disturbing trend of lower standards and achievement in public education in the two primary fields of reading and mathematics, particularly for minority students and students from low income areas, and made several recommendations to counter the trends it published, mainly that of "The Five Basics," which included mandatory years of high school instruction in English, mathematics, history, science and computer science (Ravitch, 2010).

A Nation at Risk was a highly political report when it was first published in 1983*,* and the report can be examined from different perspectives. Two perspectives that are of importance to

this research are the political nature of *A Nation at Risk,* and the impact that it had on the field of education. In terms of the political framework of *A Nation at Risk*, it should be mentioned that nowhere in the Constitution of the United States, nor in the Bill of Rights, nor any other Amendment to the Constitution, is there mention of how the educational system of the United States must work or what impact the Federal Government has on public education (Hewitt, 2008). The bridge between the political ramifications and effect on the educational system of the United States has been bridged due to the content of this report. *A Nation at Risk* was one of the first documents that confirmed (at the time and for the future) the role of the federal government in public education (Hewit, 2008).

  A Nation at Risk supported several aspects and founded part of educational systems' policies that can currently be found at public schools.   In *A Nation at Risk* there was a call for more rigorous standards at all levels of schooling, raised admission standards for four-year institutions and a call for standardized tests to be implemented at different points from one level of schooling to another, which foreshadowed the high school graduation tests and EOCs that are now required in almost every state (Borek, 2008). *A Nation at Risk* was one of the first government reports to offer, along with other ideas and educational practices, the idea of high stakes testing. *A Nation at Risk* addresses the matter of testing and discusses the use of testing in the education system. In brief, *A Nation at Risk* recommends that standardized achievement tests be administered to students at major transition points in their education for the purpose of identifying the need for remediation or for accelerated work and that the tests be given as part of a nationwide system of state and local standardized tests that act as a diagnostic to judge student progress or in modern language, student gains (Casey, Bicard, Bicard & Nichols, 2008).

A Nation at Risk has been viewed as a precursor to more recent policies passed into law, most notably *No Child Left Behind*. This is most evident in the various educational movements that were started before, during and after the time of the publication of *A Nation at Risk*, such as the excellence movement, restricting movement, and the standards movement (Hunt, 2008). As previously mentioned, the standards movement in education coincides with *No Child Left Behind*. Most of the educational reforms come from the mid-1980s main document titled *A Nation at Risk*. Recent reforms have been set forth based on the findings in that report. Standards based reforms have been the newest development in the American education system and have been predicated upon the *A Nation at Risk* report and scores from the Trends International Mathematics and Science Study (Paik, Zhang, Lundenberg, Eberhardt, Shin, & Zheng, 2011).

National Science Education Standards (NSES). The National Science Education Standards are a national set of guidelines that were developed for primary and secondary schools in the United States and led by the National Research Council in 1996 (Yeager, 2005). The focal points of the standards were drafted by committees from dominant professional organizations. The National Science Education Standards were based on the testing and development conducted by the National Science Foundation and the Math and Science Partnership (Banerjee, 2010; Moyer-Packenham, Bolyard, Oh, Kridler & Salkind, 2006). *The National Science Education Standards* were published in 1996, after four years of discussion, debate, and finally, consensus (Kimble, Yager, & Yager, 2006). They were an attempt to nationalize science standards rather than having the individual states have their own science standards. The idea was that national standards would ensure that all states have some type of conformity with each other. A change from the use of state to national science standards would impact teachers due to the fact that the

science standards would change, and teachers would have to adjust to the national standards versus the state standards.

The National Science Education Standards were significant because they changed the emphasis of what it meant to learn science. "Throughout the history of science education, a major emphasis in learning has been on the history of a theory, principle, or concept important in understanding a discipline. By comparison, the demand for a lifelong emphasis in a science-technology society includes a vision of what we do not know and our expectations for any topic that will be taught. Future characteristics may differ from those of today. The sciences have been described as having an endless frontier" (Hurd, 2000, p. 285). A major emphasis in the National Science Education Standards was on the value of teaching via inquiry rather than direct instruction.

This idea of having a national set of science standards that are to be taught in the schools has not only been influential on the national scale, but it has implications for the United States of America as a part of a larger global community. Due to the influence of scientists, science is a necessary subject to study worldwide, not only in the United States, and has undergone changes from classroom demonstrations to individual student lab work in order to demonstrate the working principles of science in the classroom (Rudolph, 2007). In order to develop the sciences in the United States there has been a wide variety of changes in the educational system.

One step is not only to develop science standards for the public school system, but also to develop different programs that function as a part of a public school. A recent emphasis that has emerged from science education reform efforts in the US is a move toward a Science, Technology, Engineering and Mathematics (STEM) inclusive academic system. As its name implies, STEM focuses students on the study of the sciences, technology, engineering and

mathematics and integrates those four subjects into one coherent program of study. Establishing schools focused on STEM education is one of the current trends in K-12 education, but it is not really new. The STEM academic system can trace its roots to 1904 with the founding of the Stuyvesant High School, which was the first specialized school in science and technology in the United States (Thomas & Williams, 2010).

No Child Left Behind (NCLB). One of the major policy changes in recent years is the reauthorization of the *ESEA (Elementary and Secondary Education Act)* as the *No Child Left Behind Act (NCLB)*, passed into law in 2001. *NCLB* mandates that every child from Grades Three through Eight is to be tested yearly in reading and mathematics and once in elementary, middle, and high school in science using state assessments. Decisions on how to reform schools will be made by the states, and low performing schools will receive help to improve. Finally, students in persistently dangerous schools or low performing schools will have the ability to transfer (Ravitch, 2010). A National Report Card is used to determine high and low scoring schools and districts and to offer funding accordingly, to develop new learning strategies, and to guide policy makers during the legislative process (Schuler, 2012).

The *No Child Left Behind Act (NCLB)* was one of the more important and significant laws passed concerning education. *NCLB* included several mandates that required adherence. *NCLB* required all states to submit a single statewide accountability plan that had to include annual assessments in mathematics and reading in Grades 3–8, at least one assessment in Grades 10–12, and Science assessments once in elementary, middle and high school, beginning in the 2007/2008 school year (Husband & Hunt, 2015). In addition to testing, under *NCLB* each state was required to establish a baseline of Adequately Yearly Progress (AYP) based on Annual Measurable Achievement Objectives (AMAOs) (Husband & Hunt, 2015).

With *NCLB*, a new era in education began: the advent of the standards-based educational system, a major driving force in instructional practice. There are many ways to define educational standards under *NCLB*. One way definition, using terminology from *NCLB*, is that standards are normative specifications for the steering of educational systems leading to specific educational goals or competencies (Waldow, 2015). Now that the *NCLB* requires state assessments in academic subjects based on specific educational goals, along with AYPs and AMAOs, penalties and rewards can be administered by the federal government as a means of forced compliance. *NCLB* reformed the model of federal funding for public schools by requiring, among other things, rigorous standards-based assessment for all students. Based on the results of these assessments the government can penalize schools by withholding funding, unless school districts engage in corrective actions, reward schools with greater sources of funding, or simply leave alone those schools that meet their AYPs and AMAOs (Kaufman & Blewett, 2012).

Race to the Top. One of the more recent initiatives (2009) put through by the Obama presidency is *Race to the Top*. The *Race to the Top* is an initiative that has a shared 4.3 billion dollar stimulus for states to either reward high performing teachers, or teachers whose students show the most achievement or highest scores, or to penalize teachers based on the low achievement and low scores of their students (Ravitch, 2010). This allows districts to set accountability levels based on EOCs, as well as scores on other state assessments.

Unlike *NCLB, Race to the Top (RttT)* followed the *American Recovery and Reinvestment Act of 2009*. *RttT* was an initiative from the executive branch put in place to induce state-level policymaking that aligned with education objectives on college readiness, the creation of new data systems, assessing teacher effectiveness and dealing with persistently low-performing schools (Howell, 2015). *RttT* was designed so that states held control of their own baselines,

versus a much larger nationally-based baseline scale, as with *NCLB*. *RttT* was set up as a large-scale state empowerment program that packaged reforms in states and provided incentives to states to accelerate the pace and reach of these activities, such as higher standards and 21st-century assessments, to increase educator effectiveness and the turnaround of failing schools (Weiss & Hess, 2015). Also unlike *NCLB*, *RttT*'s program elements were anchored firmly in the individual states and school districts. Due to *RttT* being rooted in individual states and school districts, states, districts and schools were able to tap into existing constituencies' support and resources for the ideas, enthusiasm, and pent-up creativity surrounding academic subjects (Weiss & Hess, 2015).

As with all government initiatives, *RttT* has strong points of contention, both positive and negative. The majority of criticisms that arise regarding *RttT* come from its statements on teacher evaluation. Measures of teacher effectiveness will be further explained in this literature review, but it is noteworthy to mention them here with the *RttT* initiative. Teacher effectiveness is a part of the teacher evaluation process which can have multiple parts. One particular criticism of *RttT* is that it does not define what constitutes an effective teacher in some academic subjects and compares those teachers to teachers whose subjects have state mandated testing. *RttT* becomes problematic when evaluating teachers in non-test subjects and having states build their own guidelines for teacher effectiveness in those non-tested subjects and evaluating non-tested subject teachers in comparison to teachers that have state mandated tests (Aguilar & Richerme, 2014). The positive aspects that were brought about by *RttT* were that reforms were state mandated, not mandated through the Federal Government. States were required to show how educational landscapes were changing based on nineteen areas of selection criteria, and

states could earn points based on their past work in the academic achievement of their students as well as what they planned to do for the future (Stern, 2013).

Next Generation Science Standards (NGSS). The most recent attempt to create national standards for science is The Next Generation Science Standards, which were developed through the work of a variety of stakeholders and published in 2013. They have been adopted by some states, but Florida is not currently on that list, so they do not have an impact on the Florida Biology EOCs. They are significant in terms of national conversations about science education reform and may be adopted by Florida in the future, which would impact the content and format of Florida science EOCs, which, in turn, would impact a teacher's educational practice.

Some authors argue that for the most part, the ideas that are expressed in the NGSS are the same as the previous standards, with the main difference being the language used to write them (Melville, Dowdle, & Campbell, 2015). The NGSS are organized around three dimensions, all equally important for meaningful science learning: DCIs (disciplinary core ideas), SEPs (science and engineering practices), and CCs (crosscutting concepts). The standards are written in terms of PEs (performance expectations) (Duncan & Cavara, 2015; Clary, Wandersee, & Tucker, 2014). Each standard is comprised of four sections: the code and title of the standard, the performance expectations for the students, the foundations of the standard, and a connection area which interconnects multidiscipline standards (Workosky & Willard, 2015). Along with the written standard are performance tasks. Performance tasks are built into the standard so that students have a means to demonstrate their understanding of scientific ideas and concepts (Clary, Wandersee, & Tucker, 2014).

Some worry that the nature of science is lost in the verbiage of the NGSS. Due to pedagogical differences and ideological differences in student outcomes versus student

assessment, the idea of the 'nature of science' is lost in the translation from teaching the subject to the assessment of the subject material (Lederman & Lederman, 2014). Currently efforts are underway to develop assessments aligned with the NGSS. Developing, approving, and implementing new state and national assessments aligned with the NGSS will take time as well as a wide range of resource allotment (Pratt, 2013).

One issue with the NGSS is creating links between the national standards and state standards, such as the LAFS (Language Arts Florida Standards), with the types of questions asked. Research by Sherdan, Anderson, Rouby, LaMee, Gilmer, and Oosterhof found that one source of frustration experienced by teachers was the fact that in high-stakes assessments such as national assessments, which are administered to test student understanding, only identification type questions versus contrasting knowledge and application questions are put forth (2014). "The multiple-choice format does not allow assessment of whether students can construct an explanation, which is what the performance expectation requires. Because identifying and constructing are very different skills, the approaches to teaching students to identify versus to construct a scientific explanation are likely to differ. These issues can result in misalignment of performance expectations, assessment, and curriculum" (Sherdan *et al.*, 2014, p. ??).

Like the NSES, the NGSS emphasizes the importance of "depth over breadth" (Pratt 2013). This approach entails developing a deeper understanding of a subject instead of speeding through a list of ideas and facts (Pratt, 2013). This type of curricular and instructional change requires time and momentum to build the capacity of the school or district to implement and maintain the instruction, curriculum, and assessment called for by the change of curriculum (Pratt, 2013). Changes in assessments will also be needed. This change of assessment will be necessary due to the shift in curriculum and will necessitate change at different levels. Due to

the curriculum practice change, assessment will have to shift as the instruments used at the current local, state, and national levels change to meet the requirements of the new standards and curriculum (Pratt, 2013).

Next Generation Sunshine State Standards (NGSSS). The State of Florida uses the *NGSSS* as its educational standards in the academic field of the sciences. "The Next Generation Sunshine State Standards describe the knowledge and process skills that you are expected to learn before graduating from high school" (Tarbuck & Lutgens, 2000, p. ??).

In Florida the standards have been changed three times in the past ten years. These changes have not come from the teachers but from those outside the classroom, primarily from the state legislature. In Science in the late 1990s the set of standards was the Sunshine State Standards (SSS), then came the Next Generation Sunshine State Standards, or NGSSS (Nelson, Fairchild & Grossenbacher, 2007; Sampson, Enderle & Grooms, 2013). Unlike the NGSS, which has adopted a three dimensional approach to science instruction, the Florida NGSSS are structured as science content statements that students are expected to master at each grade level in physical, life, and Earth and space science, as well as the nature of science.

In both the previous SSS and NGSSS, the goal is to promote a flexible instructional system as well as to apply practical aspects of a quality district science program to make suggestions for program planning and evaluation and emphasize what students should know at the appropriate grade level (Filippo & LaHart, 2010).

Science Teacher Instructional Practices

Science teachers have unique issues that they face that are different from other fields of education due to the content of the material that they teach. This is because not only is science an ever-changing and evolving field, it incorporates other subject material as well, such as

Language Arts for the scientific writing aspects such as lab reports and mathematics for calculating and graphing.

The primary function of science in the classroom setting was to educate the populace on the technology of the time and how that technology could be used. For the last 350 years the desired direction in science education was to introduce the public to how developments in science serve to better the human race by providing the means to advance current technologies into a more efficient way of doing something, or to broaden the human perspective of the world around them (Hurd, 2000).

Ideas on Direct Instruction. Direct instruction is one of many classical methods of instruction. There are various arguments for direct instruction. The simplest way to explain direct instruction is that students are given information about a particular subject from a teacher and then the students are required to retain that information for future uses, i.e., tests or any other type of assessment (Hushman & Marley, 2015). There are proponents for this method of instruction, critics of this methodology, and those who search for a middle ground with direct instruction and other methods of instructions.

Direct instruction has some positive characteristics. One positive characteristic of direct instruction is that of time management. One of many potential limiting factors of what material a teacher can cover in a class is time. This is due in part to the setup of educational standards and learning calendars. Due to educational standards, pacing guides, and learning calendars teachers' instructional practices are limited by three distinct criteria: content selection, time allotment, and pedagogical methods of instruction (Keena & Russel III, 2015). Not only has direct instruction showed that it is more efficient from a timing perspective, but there are also studies in the literature that show that direct instruction is effective. In a classic study students

demonstrated a tendency to perform best on standardized tests after the instructional method of direct instruction was introduced due to the introduction of terminology not normally associated with other academic fields (Liedtke, 1996). As shown in a more recent study by Huelskamp (2015), due to the limited class time, ranging between forty-five to fifty minutes, direct instruction resulted in higher standardized test scores than other types of instructional practices employed by the teachers.

Direct instruction has some criticisms. In one aspect, direct instruction does not allow for active learning, but often students are presented with great amounts of information and are expected to retain that particular knowledge. Another criticism of direct instruction is that students are not actively engaged in the learning process. In order to counter this, a more active learning approach is required. In order to facilitate active learning one research proposed a five-step plan in which students are more engaged with the learning process. The five steps of a more active learning process include providing context to the material being taught, doing fewer and more focused activities or problems, having the students build a narrative around the problem, focusing on deep structure of the issue or issues at hand, and finally, having students apply this knowledge in context to the work that they have done (Cook & Klipfel, 2015).

A middle ground can be found with direct instruction and other methods of instruction. When searching for a middle ground or workable area or even a compromise within the methodological ideology of direct instruction, there are several compromises that can be met. One such idea is that of instructional guidance. Instructional guidance suggests a middle ground that incorporates ideas of direct instruction with principles from active learning strategies. One method using this approach is to have students learn in such a fashion that the teachers do not have the role of the "expert" but have the role of a "mediator." In this role teachers instruct the

students on subject material, not by telling the class the material, but instead by facilitating discussion, asking leading questions, providing hints or suggesting a certain line of questions, and finally having the students themselves propose a model for the material that is being presented to them (Hushman & Marley, 2015).

Ideas on Inquiry Learning. Inquiry learning is one of the trends in teaching practices. As mentioned in the literature review, inquiry learning is aligned with both the NSES and the NGSS, as well as the Common Core State Standards. Inquiry-based learning focuses on an active engagement in learning with students that provides new experiences (Ireland, Watters, Browniee, & Lupton, 2012). With inquiry learning students are given a problem and assessed on how it is completed, normally in the form of either a written or oral report. Student inquiry learning involves several areas of learning: students scrutinize and assess a problem or issue and then analyze and solve the problem or issue, showing all of the steps involved and finalizing it in a report with accompanying references (Walker, 2014). Inquiry learning is also accomplished through smaller, more diagnostic means. Inquiry learning can take the form of multiple smaller assignments instead of large, grandiose projects. Some smaller assessments that would follow an inquiry learning practice would be a formal paper, an informal project proposal and other artifacts including independent projects such as artwork, reflective papers and critiques of the work of others (Walker, 2014). Inquiry learning is a practice that at some level is employed by most teachers, but there are moments in a classroom when inquiry learning may not be the best practice. Teachers may not be able to implement inquiry learning in the classroom for several reasons. One reason that teachers may not infuse inquiry learning into the classroom is student related. The level of the students may not be high enough to handle the workload due to grade level, appropriateness of the lesson or other academic reasons (Song & Looi, 2012). Other

reasons teachers may not incorporate inquiry learning are due to their own personal beliefs and practices which act as restraining forces. Science and mathematics teachers are reluctant to accept innovative approaches because the teachers themselves deem this particular learning approach too complex for their students, or inquiry learning may contradict their own personal beliefs and practices. Finally, due to assessment-oriented educational goals, inquiry learning is deemed too time consuming by some teachers (Song & Looi, 2012). Inquiry learning does have positive aspects and inquiry practices do have positive outcomes on student learning. A growing body of research has provided evidence of the positive impact of inquiry practices on student learning due to the fact that students are more engaged through inquiry than other instructional practices because there is an emphasis on problem-solving strategies and conceptual understanding versus more traditional methods of instruction (Riconscente, 2014). Inquiry is more of a guide to students than other instructional styles. The inquiry process works by incorporating concept-based ideas and searching out essential questions to help solve problems, instead of just being given information from an authoritative source (Walker, 2014). Inquiry-based learning can be made to work in any given academic setting. This is accomplished through the achievement of standards. Achieving standards is possible in rural, urban, and suburban settings due to the alignment of assessments, curriculum and learning objectives that prioritize learning and foster mastery of the subject (Riconscente, 2014).

Assessment in Science Education

Teachers have many means of assessment at their disposal to determine student gains in the classroom. A basic method to measure student gain and knowledge is very simply to test students. The idea of testing students is not new; however, the most recent educational philosophy behind the idea of testing is high-stakes testing. Within the field of education there

has been a longstanding notion of standardized tests. Standardized tests are prevalent at the local, state and national levels and are used to assess student progress and achievement. Teachers also utilize formative assessments. Formative assessments have not been perceived as being critical to students, teachers, and administrators, but they can be more important than high-stakes tests that are used in the classroom, due to the fact that the formatives regularly monitor student progress (Pratt, 2013).

Assessments have changed over time. Along with the more progressive ideas of assessments, there are multiple ways assessments can be formatted beyond the more traditional methods. As a result of the NGSS, there is a focus on developing assessments in science that enable students to demonstrate their ability to use science and engineering practices in an independent setting as well as to verify their understanding of the disciplinary core ideas and show that they can communicate the connection between the crosscutting concept and the core ideas (Pratt, 2013).

Current Trends in Methods of Assessments. Education is going through a period of change as many new ideas and innovations are being introduced and tested. One of the many new practices is that of changing how students are assessed. Teachers are transforming their assessment practices in several ways. Assessments are important for both the non-EOC teachers and teachers who administer an EOC due to the fact that in some instances, the assessment is a major factor and sometimes the driving factor (i.e., teaching to the test) which causes teachers to choose certain instructional practices rather than others. Not only are students being assessed with their grades or the score they receive in class, but schools are also being assessed.

One current way to collect data about student assessment is to build individual student portfolios. A teacher's logbook, anecdotal records, and the student's portfolio are being used as

assessment strategies, to record information as well as to provide competency levels to further guide teachers in identifying the stages in the development of competencies of their students (Deslandes & Rivard, 2013). This is a change from the older assessment styles. Along with the move toward building student portfolios and combining student work, there is also the practice of changing the traditional "grade" of students. Traditional grades and scores are sometimes replaced by qualitative comments at the elementary level (Deslandes & Rivard, 2013). There are some negative aspects to this method of student assessment. Some teachers are resistant to the implementation of the reform in its entirety, alleging that they have to give marks for competencies that, according to them, have not been evaluated (Deslandes & Rivard, 2013).

Typically schools and teachers use assessments for grading purposes. The most frequent type of assessment model that school teachers use to assess learning is in the form of a test or a quiz (Al Duwari, 2013). The more progressive thought for the changing role of the assessment is as a learning model. Both assessment for learning and assessment as learning models are seldom used by teachers, primarily because there is resistance to changing from the traditional idea of education and also because there were no statistically significant differences between teachers' practices of assessment models that can be attributed to their exposure to training (Al Duwari, 2013). Typically, assessment results show the high score, the low score, and the scores in between. This measurement is the minimum amount of data that assessment results can show. Minimally, the levels of achievement can limit the benefits of performance assessment (Fenwick, 2012). A more progressive way assessments can be utilized is by developing alternative practices. Using assessments as a tool for teaching can result in differentiated practices that define the learning contexts for specific groups of students (Fenwick, 2012).

In the United States there has been a sweeping agenda to change the assessments to add in teacher accountability. Due to the existing accountability movement in the United States, a plethora of educational policies and standards have emerged at various levels to promote teacher assessment competency, with a focus on assessment education (DeLuca & Bellarra, 2013). This has led to frequent and often confusing policy changes by which teachers have to abide. Some teachers, especially new teachers just entering the field, were given little education about the assessments and standards. Despite these policies and standards, research has shown that beginning teachers continue to maintain low competency levels in assessment (DeLuca & Bellarra, 2013). This has been due to the fact that most education programs are set up in such a fashion that new teachers, lacking the experience and wisdom of teachers that have been in the field of education longer, have misaligned practices. Some areas of misalignment come from the confusion and aggravation about conflicting policies, standards and practices. With this limited assessment education, there is the potential to misalign assessment standards with classroom practices, therefore leading to a lack of assessment competency (DeLuca & Bellarra, 2013).

Criticisms of the ways standardized tests are being used in American education are common. Many note that the assessments themselves need to be changed or rewritten in order to present a more accurate picture of student gains, so that the assessment is more than just a reiteration of facts on a piece of paper. Some suggested replacements for the current standardized tests include designing tests that measure critical thinking and student application of knowledge, as well as assessments that are designed in response to reform-based standards like the Common Core State Standards (Goodwin, 2014).

Influences on Methods of Assessment. High school teachers have a different perspective than middle grade teachers. These differences are due to the differing constraints

and educational policies at each level of instruction. In aspects from one particular study, standards-based reforms were counterproductive to learning goals as seen by educational reformists. In analyzing a questionnaire sent to various high school science teachers that had a 161 question Likert-type scale and two open-ended response questions, it was determined that the majority of teachers felt that standardized testing had a significant influence on instruction and assessment in a way that was counter to the learning goals promoted by science education reformists (Aydeniz & Sotherland, 2012). A wide range of factors come into play when researching the influence on methods of assessment. As previously mentioned, the type of instructional practices has an influence due to either the narrow, constricted forms of assessment from direct instruction or the wider base of assessments with inquiry learning. The scheduling of the classes and the time allotted can affect methods of assessment. One type of class scheduling that allows for greater flexibility is that of block scheduling. Due to the increase in instructional time that block scheduling provides, it has been reported that teachers can increase active teaching strategies that provide greater opportunity for student-directed instruction with the goal of improving student performance (Huelskamp, 2014).

Not only does a class schedule affect assessments but there are instructional methods that teachers can employ that can have a desired outcome. One is the use of scaffolding. Scaffolding can facilitate instruction by bridging the gap between what students can do on their own and what they can do with support provided by a teacher through conceptual and procedural planning and implementation of contextual class assignments (Belland, Walker, Olsen & Leary, 2015). This idea of scaffolding is to help build a student's understanding of subject material. One way to apply scaffolding is through the use of interactive technologies. It has been demonstrated that computer-based techniques inclusive to the scaffolding process have not only been shown to be a

positive factor in instruction but also have led to an increase in test scores (Belland, Walker, Olsen & Leary, 2015).

One influence on the methods of assessment that is similar to what was previously mentioned is the application and use of computers in the classroom. This type of learning, sometimes referred to as e-learning, has had an impact on methods of assessment, going from a traditional paper and pencil-based test to a computerized version of the test, sometimes with interactive sessions. With e-learning there are multiple types of assessments depending on the subject. Some assessments include the building of workable models, open-ended questions based through the Internet accompanied by computer-aided drawing and designs as well as the performing of mathematical functions (Romero, North, Gutierrez, & Caliusco, 2015).

One final influence on methods of assessment is the idea of having more frequent but smaller assessments. This method of assessment can be based either on a traditional route of education, that of direct instruction, or through the use of multimedia outlets that have the students more engaged in the learning process. This idea of rapid assessments is comprised of assignments that are required to be completed quickly and are dispersed throughout a classroom instructional period that carry weight versus diagnostic assessments which traditionally are not calculated into a student's grade (Renkl, Skuballa, Schwonke, Harr & Leber, 2015).

Dominance of EOCs. End of course exams have become an academic fixture in classrooms throughout the United States. The EOC carries with it two significant characteristics that will be further elaborated on in this section, that of being used as a measure of student learning, and as a means of measuring teacher effectiveness. Due to the importance of this particular assessment there are both positive and negative critiques of using the EOC to measure student gains and teacher effectiveness. This is due to the fact that the EOC has come to

influence both a student's effort as well as their approach to learning and study habits (Jensen,

McDaniel, Woodard, & Kummer, 2014). From the teacher's perspective the EOCs have

influenced their teaching style as mentioned both in a previous section and a later section of this

literature review.

Use of EOCs as a Measure of Student Learning. Throughout the course of history, the

American education system has undergone dramatic change. In recent years, one important area

of change is the advent of the formal administration of an EOC. An EOC is one example of a

high-stakes test as defined by Au (2007). It is a "test used for the purpose of advancement and

graduation" (p. 260). In American schools, exit exams have changed dramatically in the last 20

years based on the federal and state policies of the time and how the education landscape has

shifted from minimum competency exams to standards-based assessments (Shuster, 2012). Over

a period of seventy years, there have been shifts in emphasis in the American education system

and over the course of that time different strategies have been pursued. With the creation of the

Elementary and Secondary Education Act in the early days of educational reform came a variety

of graduation requirements which have increased with the passage of time. Some of the

graduation requirements that have been used throughout the years are achievement tests; school

report cards, with stakes for schools, teachers, and administrators; minimum competency exam

(MCE) graduation requirements; voluntary end-of-course examinations (EOCEs); and

compulsory EOCEs (Bishop, Mane, Bishop, & Moriarty, 2001). "The latter four strategies are

collectively referred to as standards-based reforms (SBRs)" (Bishop, Mane, Bishop, Moriarty,

Murnane, & Steinberg, 2001, p. 271). According to Zinth, as of 2012, twenty-two states required

EOCs. She further noted that:

Students must pass the EOC to graduate from high school. Twenty-two states currently administer one or more EOCs to all students in an EOC course. This number will increase to 26 states over the next decade as EOCs are anticipated to be implemented in Alabama, Connecticut, Hawaii and Ohio. Eight states currently require students to pass one or more EOC assessments to graduate from high school. This number will likely increase to 15 states by 2020, with the anticipated implementation of EOCs as exit exams in Alabama, Connecticut, Florida, Louisiana, Ohio, Texas and Washington. Eleven states currently administer EOCs to all students in an EOC course, but do not require students to earn a passing score. These 11 states include California, New Jersey and South Carolina, which use another assessment as the state's exit exam. Finally, at least five states -- Georgia, Kentucky, North Carolina, South Carolina and Tennessee -- require that the score on the EOC be factored into a student's final course grade. A sixth state, Texas, offers districts a deferral of a policy to incorporate EOC scores into students' final course grades, but for the 2011-12 school year only. (p. 1)

EOCs are conceived of and used differently in different states. The EOCs of the State of Virginia measure results and emphasize recall of factual content rather than an inquiry-based learning system (Van Hover, Hicks, & Irwin, 2007). They are high stakes because they help determine if the student is eligible to graduate. EOCs are administered in the state of Virginia as a part of that state's accountability system. In Virginia, the accountability system is comprised of three areas: content standards, high-stakes testing, and revised standards of school accreditation (Van Hover, Hicks, & Irwin, 2007). "For a school to be considered accredited and in good standing with the Virginia Department of Education (VDOE), 70 percent of students

who take the EOC must pass" (Van Hover, Hicks, & Irwin, 2007, p. 92). All of the data is gathered and compiled by the state. With so much riding on the Virginia EOC for students, teachers, schools and districts, this process has been described as the new management discourse in education.

    EOCs as a Measure of Teacher Effectiveness. Recently there has been a shift of paradigm from standards-based education to an accountability movement. The accountability movement has placed a major portion of the burden of education on teachers. Due to the effect of the EOCs on a teacher's position and employment at their school, which would affect the teacher's livelihood, it is important to provide information about the accountability movement.

    An EOC is used as a tool not only to measure student gains, but also to measure teacher accountability and as a facet of teacher evaluations. The accountability movement began in 2001 with the No Child Left Behind Act (NCLB). Simply stated, NCLB has meant more standardized testing in states and districts to measure both student gains and teacher accountability (Supovitz, Foley, & Mishook, 2012). The idea of placing such importance on testing is controversial. One area of controversy is that of teacher accountability and evaluation. EOCs are becoming one of the many components of teacher evaluation (Croft & Buddin, 2015). This idea of a teacher's performance being linked to student achievement has led to controversy in the educational workplace. The fact that student achievement is linked to teacher evaluation, even if it is just one part of the evaluation process, has several implications. There are four major criticisms in linking student achievement on EOCs to teacher evaluations. The first criticism is that EOCs are not entirely accurate. An EOC is only a snapshot of a student's total knowledge of the subject and may or may not reflect the totality of what was learned over the course of an academic year (Croft & Buddin, 2015). The second criticism is that EOCs do not account for all of the

variables that are present in a high school setting over which a teacher has no control. The potential background variables that may affect a student's test score are wide ranging, including a student's own personal and family background and other factors not directly linked to the school or teacher, peer issues in a high school setting, stressors that students feel throughout the school year and at the end of the academic year, and the fact that students are not randomly assigned to a teacher (Croft & Buddin, 2015; Suldo, Shunessy, Thalji, Michalowski, & Shaffer, 2009). The third criticism is the lack of stability of the EOCs, resulting in differing value-added measures from year to year. The passage of new educational acts and reforms and amendments to those acts, coupled with the change of policy as well as the addition or subtraction of school board members or administrators at the local level, or elected or appointed state or federal officials, results in a lack of consistency from year to year (Croft & Buddin, 2015). Very simply put, what might be in effect one year may change the next year, and even that varies over subsequent years. The fourth and final criticism is that value-added measures are not related to other measures of teacher quality. It might be the case that one teacher has all honors or advanced preparatory students, and another teacher has a general population with inclusion students, which may or may not affect the grades or the students' performance on an EOC. The EOC itself does not provide a direct indication of why some teachers are more effective than others, nor is there any reference to how individual teachers could improve their instruction methods (Croft & Buddin, 2015). The above-mentioned criticisms of how EOCs are linked to teacher performance and to teacher evaluation have led to several different and ongoing legal challenges to the current methods by which teachers in the public realm are evaluated (Croft & Buddin, 2015).

The new management discourse in education emphasizes the instrumental (EOC) purposes of schooling--raising standards and performance measured by examination results, level of attendance and school leaver destination--and is frequently articulated within a lexicon of enterprise, excellence, quality and effectiveness, all of which can either positively or negatively affect all of the stakeholders in this particular educational system (students, teachers, administrators, school board members, parents, and other interested parties) (Van Hover, Hicks, & Irwin, 2007).

Other Uses of EOC Data. EOCs are used in other ways, not just as a testing system for student gains or teacher accountability. The EOCs are a large source of data for schools and districts; with all of the available data, schools and districts can then form and re-form aids and policies that guide instruction. EOCs affect not only the teacher, but also the educational leader.

One particular case study, a 2004 study of NCLB, found that districts were increasingly using student achievement data from the test scores to mold instruction and academic policies such as curriculum and pacing guides, along with providing examples of lesson plans to be implemented by the teachers (Supovitz, Foley, & Mishook, 2012). With the massive amount of data being generated every year, it can be difficult to interpret the numbers into some form that is usable by the districts and states. This means that the focus on instructional improvement is based on the previous year's EOC scores. This process of collecting and interpreting data leads to other issues and concerns. Just focusing on data-based improvement, the process has also brought increased attention to the data themselves and the multiple ways that the data can be interpreted. Several systems have been engineered to interpret the data in a meaningful fashion and transform the quantitative aspects into practical actions such as policy building and altering instructional practices (Supovitz, Foley, & Mishook, 2012).

Developing serviceable information from raw facts and figures is a multistep process. The instructional and policy scaffolding that is developed comes from the raw numbers and facts, which are then transcribed into data and then translated to knowledge and purposive information (Supovitz, Foley, & Mishook, 2012). Frameworks have been developed for the specific purpose of "trying to figure out what the data means." In some cases the developed framework is used to develop tools for collecting and organizing data to be analyzed and summarized into information, which is then synthesized into knowledge to help make decisions on policy and instructional practices (Supovitz, Foley, & Mishook, 2012).

Benefits of EOCs. There are three reported reasons for adopting EOCs in a district or state. The first reason for adopting EOCs is the connection between EOCs and the academic rigor as set by that particular state. In 2008 Zebala et al. reported that states use end of course tests to increase the content that students are expected to learn and to be proficient in. In fact, the report by Zebala et al. further states many district administrators and state education officials were in favor of EOCs due to the fact that EOCs might improve the rigor of course content, not just student achievement (2008). Some proponents of EOCs claim that EOCs increase student achievement. Another reason schools, district, and states use EOCs is not only to measure student gains, but to measure school and teacher gains as well. EOCs provide a numerical measure that is quantifiable when it comes to the distribution of funds and a means of identifying succeeding and failing schools, teachers, and students so that the proper course of action can be taken (Shuster, 2013). A third and final rationale for school districts and states to administer EOCs is in the consistency of the material that is taught throughout the geographic area. In theory, two schools should be teaching the same material and the same academic standards at the same time, so that students can move freely between public schools and gain the same

knowledge at the same pace. "Not only is taking the right number of courses important, the report found, 'but taking the right kind.' End of course tests can help ensure that when a student finishes algebra, it is not just because the semester ends but because some level of mastery has been achieved. The use of an end of course assessment can reasonably ensure that an algebra class in one school or district is similar to one in a neighboring district" (Chirste, 2007, p. 4). It also ensures that all students are not only receiving an equal chance to graduate from their school, but are also prepared to further their academic career at a college or university.

The State of Pennsylvania also administers an EOC, though its purpose is different from Virginia's use of EOCs discussed above. The EOC in Pennsylvania is not considered a "high--stakes test" as previously defined, but it instead carries more of a diagnostic role. Pennsylvania's state assessment uses the data generated from the test to provide information and feedback to the teachers and administrators about the students' academic growth (Van Hover, Hicks, & Irwin, 2007). Based on the information gathered from Pennsylvania's EOCs, academic policies and instructional practices are tailored more to fit the needs of the students. The philosophy of using an EOC in the manner that Pennsylvania does has broad appeal to other states. Pennsylvania uses this value-added longitudinal tracking of results to provide diagnostic information about students' academic growth and then uses that data to form new policies and practices instead of as a requirement for graduation (Van Hover, Hicks, & Irwin, 2007).

Criticisms of EOCs. Like some other items, the EOC is not perfect and has potential issues and problems. Some of the issues and problems that the EOC carries with it affect teachers, not only in their personal lives, but also in their professional practices.

Criticisms directed toward the EOCs include the fact that EOCs are not 100% reliable sources of data. In some cases even though a student might "pass" an EOC, this does not

necessarily transfer into future success. In a study by Christe (2007) it was reported that even though students might do well on an EOC, this does not predict future success at the college level, particularly first year college courses. In some cases when states and district raise the standards, or the minimal passing scores on EOCs, it affects student achievement. In states that have raised the state-mandated minimum course requirements there was a high correlation with reported high school dropout rates (Van Hover, Hicks, & Irwin, 2007).

"This is an era of strong support for public policies that use high-stakes tests to change the behavior of teachers and students in desirable ways. But the use of high-stakes tests is not new, and their effects are not always desirable" (Amrein & Berliner, 2002, p. 2).   EOCs are just one tool used by schools, districts, and states that are implemented to further educational advances. EOCs affect not only the students, but teachers, administrators and other members of the district as well. What the EOCs are used for as far as testing student gains or teacher accountability also varies. Administering EOCs is not a perfect system, but it is and can be a fairly flexible system. Different states use their own EOCs for a variety of purposes, including diagnostic purposes, such as in Pennsylvania; to measure total accountability, as in Virginia; or as a combination of diagnostic and total accountability purposes, as in Oklahoma.

One functional drawback is that students are now being taught to the test versus learning to acquire knowledge. Testing is one part of maintaining the standards. Testing is the driving force behind what goes on in the classroom versus the desired inquiry-based learning model that has been proposed. Science education at the middle and high school levels has been heavily influenced by standards-based testing and a curriculum with time constraints focused on delivering outcomes, leaving little time for the creation of a curriculum based on inquiry that engages the students (Qian, 2009). There is also a trend to counter the "teach to the test"

mentality, and that is to have a more dynamic system that includes collaboration with other departments, not just one classroom, teaching field or department. Courses and curricula have developed from being isolated in the classroom setting to becoming a more dynamic field and school collaboration (Scharmann, 2007).

Perceptions of Teachers that Administer EOCs

Perceptions of teachers are important and in this particular case, a cornerstone to this research. Teachers are often the only ones students have any interactions with. The teachers also act as a representative of the school to the general public. Teachers are employees and often are at or near the base of the proverbial 'totem pole' and are not asked how the school or district should proceed, but instead have policy forced upon them. This can place the teacher between a 'rock and a hard place' as far as making personal decisions about their own goals and their students' goals.

From a teacher's perspective the state and federally mandated EOCs have become a current, prevalent means of assessment in schools. Some of the recent momentum of EOCs has come from the federal level including recent advances in legislation under the Elementary and Secondary Education Act, such as the NCLB and, more recently, the American Recovery and Reinvestment Act of 2009, which has funded the Race to the Top grant program. The latter has had an impact on the idea of EOCs as well as on teachers' preparation for instruction (Croft & Buddin, 2015; Supovitz, Foley, & Mishook, 2012).

Why Perceptions are Important. The perception of teachers is the focal point of this study due to the fact that the EOC affects the teachers' instructional practices, which in turn affects a teacher's accountability in the eyes of the school district, which can affect both professional aspects of a teacher's life as well as their personal livelihood. Teachers' perceptions

are instrumental in the educational system. The teachers' perceptions of his or her place of employment can lead to insight into both the school and the school district.

A teacher's attitude can be used as a 'tell' to determine how a school or district functions. The perceptions a teacher has often reflect the underlying character of the school and the district. One important reason to look at the perceptions of teachers is to determine their feelings toward their profession, their students, and those in leadership positions. This is the case because those perceptions can act as either restraining or driving forces in the process of instructional change. Even though the character of teachers is not often studied, one can determine a teacher's character by listening to their perceptions of the workplace around them. A teacher's attitude and beliefs impact not only the teacher but those around them (Beachum, McCray, Yawn, & Obiakor, 2013). Learning about how teachers perceive their role in a school is important, as it yields information above and beyond statistical quantification. This can give information and feedback about various aspects of their professional learning experiences. Teachers can provide much more detailed feedback about areas of their profession such as in-service training opportunities, leadership feedback and developing lessons that align with aspects of learning a particular subject (Legette & McCord, 2014).

Perceptions reveal a lot about an individual. Perceptions among teachers are important due to the fact that one can discern the underlying tones that carry throughout the school. Due to the fact that teachers, just like everyone else, are emotional human beings and not pre-programmed automatons, one can determine a lot about the workplace environment by studying the perceptions of those who work in it. Perceptions of teachers not only reveal information about the teachers, department, school and district, but can also tell what the individual's role is (Chen & Hamilton, 2015).

Not only can perceptions tell a lot about a person's own character, but they can reveal various aspects of one's teaching style. The teaching style is then conveyed to the students and becomes an observable aspect from an administrator's point of view. Teachers' perceptions can be observed in their teaching style, specifically in how various topics are integrated into the classroom. Studying teachers' perceptions can also reveal information on some of the more social aspects of the school. Studying perceptions provides information about how teachers view themselves as professionals and how they are believed to be perceived through the school (Akkoyunlu, Daghan, & Erdem, 2015).

As mentioned throughout this chapter, teachers have importance when it comes to looking at any educational system, be it at the school or district level. The main reason behind this is that teachers are the ones in the school who have daily contact with the students. Teachers' perceptions are important because the interactions that they have with the students go well beyond classroom material and often extend to and impact their students' social well-being. Besides the obvious classroom work, academic teachers serve the students by providing support and engaging students socially throughout the schooling process as well as fostering school climate and providing support for the students (Ball & Anderson-Butcher, 2014). In a more detailed report, it has also been demonstrated that how teachers perceive the various social interactions among three different groups--student – student, student – teacher, and teacher – teacher--can yield information about the school and the teachers. The teachers who are perceived by both other teachers as well as students to be more emotionally knowledgeable about those around them tend to have stronger emotional expression skills (Zinsser, Denham, Curby & Shewark, 2015).

How Teachers' Perceptions Influence their Practice. A teacher's own belief can affect student performances. One area in which a teacher can have a negative effect on students is that of shared academic anxieties. This is most often evident in mathematics but it is also prevalent in other subjects. This is due to the fact that over time, teachers' feelings and emotions that they developed as students transform into beliefs which influence the ways in which they teach the subject (Hart, Oesterle, & Swars, 2013). This is based on low self-efficacy. Simply stated, if teachers did not feel comfortable learning about a subject, they pass that fear on to their students and their students do not feel comfortable. This passing on of negative or even anxious feelings and emotions then has a much more magnified effect on the students, especially during periods of high stress, such as during the time when EOCs are administered (Hart, Oesterle, & Swars, 2013). This is a more important factor for elementary rather than secondary teachers, who have subject matter expertise. It could be true for secondary teachers teaching outside their area of certification. While negative emotions can be passed from teacher to student, the opposite is also true; emotions of confidence can also be passed on to students. This can be accomplished by moving the focus away from getting the right answer toward less threatening goals, thereby increasing confidence in students. This then leads to a greater sense of achievement and more success on higher-stakes tests (Hart, Oesterle, & Swars, 2013). It becomes evident that anxiety and confidence are linked to success on EOCs and are a part of the teacher's own academic beliefs.

Teachers have also felt other pressures, not directly coming from the EOCs, but as a part of the broader testing and accountability process. This feeling of accountability coming from other areas has at best unnerved teachers. One area from which teachers feel the pressure of

accountability is the public. Public opinion demands higher teacher quality but defining teacher quality is problematic and relies on vague descriptions.

Teacher quality has been defined by four basic (and vague) terms: highly qualified teachers, effective teachers, good teachers, and poor teachers (Lucas & Frazier, 2014). These terms are then partially defined by student outcomes on EOCs. Even with the EOC, it is difficult to develop a definition for teacher quality. Some qualifications are set at minimalistic levels. Some evaluators of teacher quality might consider a teacher's qualifications, a teacher's knowledge, their students' achievement on high stakes tests, and the teacher's educational background (Lucas & Frazier, 2014). Teachers would argue that based on federal guidelines the vast majority of teachers would fall under the category of highly qualified teachers. The federal definition describes a highly qualified teacher as one who has a bachelor's degree, a state teaching certificate and knowledge of the subject matter (Lucas & Frazier, 2014). Teachers feel that this sets the minimum requirements and does not fully encapsulate different teacher qualities. More so, in the public's view, the term "effective" teacher generally refers to teachers' impacts on student achievement due to NCLB and most state accountability programs.

Teachers have a variety of perceptions about the EOCs and teacher accountability evaluations. Most teachers do feel that there is a need for an EOC, but the lengths and breadths that teachers must traverse in order to prepare their students for the test are far more complex than most realize. There are also distinctive instructional changes that teachers feel that they had to make in order to prepare their students. Some teachers seem to not mind the tests, but more teachers feel that administering EOCs is changing the academic landscape. Teacher accountability and the way that teachers are evaluated as a result of high-stakes exams like EOCs have affected teachers in a multitude of ways, from teaching practices to self-efficacy. EOCs

and the issue of teacher accountability have not only changed teachers' perceptions of education but they have also affected the public's perception of teachers. In skewing the perceptions of both teachers and the public, the entire view of the public education system has changed as well.

Teacher Perceptions of EOCs. Multiple factors, including the educational practices imposed by the district, contribute to how teachers relay knowledge to their students. One major educational practice imposed upon teachers is that of administering EOCs. Teachers are important stakeholders in the educational system. They are the first group of stakeholders that deals directly with students. Teachers work with students in a variety of ways. Teachers set up classrooms, make lesson plans, instruct the students on subject material, work with students to boost academic student gains, and work with the administration to make the school operate smoothly. From time to time academic policies are enacted by the legislature that disrupt a teacher's academic rhythm. Teachers become aware of academic policies as the policies are handed down through the chain of command at a school. Teachers are made aware of policy initiatives that include curriculum implementation, administrative policies, the administering of high-stakes tests and other policy changes that take place during an academic year (Rastkerdar & Barehat, 2014). Teachers are often not the creators of those policies, but they are the implementers of them. As stakeholders in a school, teachers hold the role of executing new curriculum and instructional procedures mandated by the local institutions (Rastkerdar & Barehat, 2014). Sometimes teachers' attitudes act as restraining forces in the change process. Teachers do not always do what they are told to do, nor do they always act to maximize policy objectives due to the fact that some teachers are resistant to change (Cohen & Ball, 1990). This resistance can be justified in several different ways. Some teachers actively ignore or subvert curricular innovation. In other instances, teachers lack the pedagogical knowledge, skills,

personnel, or other resources necessary to implement the changes. Still other teachers just feel that the policies are "wrong" and choose not to implement them (Rastkerdar & Barehat, 2014). This could be a particular issue in science instruction. A goal of science reform documents like the NSES and the NGSS has been the development of scientific literacy for all learners (Bybee, 2013). However, instead of promoting scientific literacy, some teachers feel that an undue emphasis on the EOC results in them merely teaching students how to take tests.

A wide variety of challenges faced in American schools stem from EOCs. There are particular issues for poor rural schools. In a study conducted by Wilcox, Angelis, Baker and Lawson (2014) it was found smaller rural schools face challenges set in motion which are not evident in suburban schools, but are similar in some ways to challenges faced by urban schools. Rural schools serve increasingly transient populations, and school teachers and administrators may not be fully prepared to work with increasingly diverse populations. Establishing a positive, nurturing school climate seems to be particularly important in rural schools (Wilcox, Angelis, Baker & Lawson, 2014). The EOCs are a major stumbling block for poorer schools and school districts. An emphasis on preparing for a single high-stakes test can make it difficult for schools to foster the kind of environment rural students need to succeed. The schools in this study set goals that were in line with the surrounding districts. Wilcox, Angelis, Baker and Lawson (2014) found that some teachers reported changing their instructional practices in ways that were not beneficial to all learners. One teacher expressed concern about focusing on struggling learners rather than higher learners (Wilcox, Angelis, Baker & Lawson, 2014). Other teachers described a sense of frustration and a general sense of being unsupported in their efforts to improve the graduation rate due to the mandated EOCs (Wilcox, Angelis, Baker & Lawson, 2014).

Impact on EOCs on Teaching Practices. Whether or not a teacher is required to administer an EOC can affect their teaching practices. For the most part, all teachers use a wide variety of assessments. One of the less formal ways that teachers conduct assessments in the classroom is through teacher observation, observing peer interactions and student demonstrations (Sofo, Ocansey, Nabiem & Asola, 2013). Teachers also use formal types of assessment which include skill tests, knowledge tests, and projects/oral reports (Sofo et al., 2013).

Student assessments are often combined in a number of ways in order to determine a final grade. Many teachers determine a student's final grade through a variety of tests and then the administration of a final exam. Many schools and districts, both in the United States and abroad, provide guidelines for teachers to determine students' final grades by combining a percentage of students' scores from district or state large-scale assessments with their term scores (Miller, 2013). This has caused teachers to veer away from teaching the subject material, to just 'teaching to the test.' This teaching strategy presumably is thought to help the students perform well on the tests. The practice of teaching to the test is thought to hold students more accountable to performing well on tests by motivating them to put effort into completing the large-scale assessment (Miller, 2013).

States do allow for different types of assessments for special needs students. Having different types of assessments alters the teacher's approach to instruction. Consider an example from the state of Connecticut, where a skills checklist was developed in response to federal policy that requires all students with significant cognitive disabilities to participate in state assessments and be included in measures of adequate yearly progress (Goldstein & Behuniack, 2005). Due to these alternative assessments, Connecticut special education teachers and integrated classroom teachers were forced to change the nature of classroom instruction for their

particular classroom population (Goldstein & Behuniack, 2005). Even though there was a change in assessment, the corresponding attitudes toward the program either did not change or did not have a positive result. Most teachers in Connecticut did not perceive a change in student performance due to a change in assessment, but there were some teachers who felt that the results, for their particular classroom and situation, had a positive impact on the students (Restorff et al., 2012). The role of a strong theory-of-change model in the development and evaluation of mathematics interventions shows implications for alternative instruction for at-risk students that require academic intervention (Clarke, 2014).

With the idea of assessments there is always the looming "gorilla in the room" - the standardized test. To go along with this metaphor, there is the anecdote of "where does a 400 pound gorilla sleep?" and the answer is "anywhere he wants to." One danger with standardized assessment is that the standardized test, not the standards themselves or even the subject material, drives classroom instruction. The main danger in the current U.S. educational system is that large-scale assessments are driving assessment practice and do not align with teaching practices, resulting in negative effects on instruction and students (Behizadeh, 2014).

There are many reasons to explain why there is a shift in paradigm to "teach to the test." One of the primary causes that can explain the "teach to the test" mentality is the change in educational policy. As noted above, with NCLB came a greater emphasis and significance placed on the standardized test. Specifically in science, this has resulted in a teacher belief in, and instructional shift toward, teaching to the assessment itself rather than teaching the content that is supposed to be assessed on the test (Milner, Sondergeld, Demir, Johnson, & Czerniak, 2012).

Interestingly, the beliefs that teachers hold about teaching science remain unchanged from previous generations despite policy changes mandated in NCLB (Milner et al., 2012).

Beliefs and perceptions, however, are two different things. The perceptions of what teachers should be accomplishing in the classroom are much different from the actual teachers' beliefs about what they are working on in the classroom. Due to the mandates of NCLB, perceptions of what teachers have been accomplishing or not accomplishing in the classroom have had an influence on teacher practices (Milner et al., 2012). The practices imposed by others on teachers have not influenced the feelings of teachers about teaching their subject, but they have led to a shift in what is done in the classroom. Most teachers have positive attitudes about science; however, there are other practices going on in the classroom that are not science related and take away from the overall science education that students receive (Milner et al., 2012). Reforming science education is one of many items that NCLB mandates, yet the role of the teacher is often overlooked, in terms of their impact on student achievement, when more emphasis is placed on administrative duties (McNeil, Pimentel, & Strauss, 2013). High stakes tests have clearly impacted teacher instructional practices (Goodwin, 2014).

Homework and classwork are used by teachers in nearly every academic setting, in all academic subjects and at all grade levels. Homework supports students' learning of the subject matter due to the additional time spent outside the classroom reviewing and mastering the subject (Tas, Sungar-Vural & Oztechin, 2014). Homework is given for a variety of reasons. Teachers mainly give homework to practice skills taught in the class, to prepare students for the next lesson, to increase students' participation and to contribute to personal development (Tas, Sungar-Vural & Oztechin, 2014). The age group of the students also is an important consideration when teachers give homework and classwork assignments. Homework on students' subject matter has a much more pronounced effect with older students than with younger students, and the opposite is true of classwork, with there being a more profound effect

on younger students than on older students (Tas, Sungar-Vural & Oztechin, 2014). Not just the fact that homework is assigned, but the amount of homework that is assigned is also important. It has been documented that the positive relationship between homework time and achievement is stronger for high school students than for elementary school students due to the types of assignments and the differentiation strategies that are employed by the high school teacher (Tas, Sungar-Vural & Oztechin, 2014). Homework is important due to the fact that it acts as reinforcement to the lesson being taught and can show students how to work through problems as well as provide possible questions similar to those found on a variety of assessments.

Teachers can employ a variety of instructional practices in the classroom. The type of method that a teacher may use is often based on their own teaching philosophy. Each philosophy of teaching has its own corresponding typical styles of teaching. Not all teachers employ the same strategy; in fact, some teachers may employ different instructional strategies during the course of an academic year or even the same lesson, while other teachers may employ the same philosophy and teaching style throughout their entire career. Notable teaching practices affect both the teachers and the students under their instruction.

Conclusion

Reports, legislation, and policies like *A Nation at Risk*, *NCLB*, and *Race to the Top* had a significant impact on K-12 education. One major change has been in the way assessment is used for student, teacher, and system accountability. Assessments are driving education. One specific type of assessment, the EOC, affects the educational practices of teachers in high schools. This is due to the pressure felt by both the teacher and student to either prepare for or perform well on the exam. An EOC can determine whether a student passes or fails a class, and in some cases even whether or not the person graduates. EOCs also affect teachers due to the fact that this

particular high stakes test measures a teacher's effectiveness in the classroom and can impact the teacher's employment and/or salary expectations. EOCs affect teachers in three distinct areas: type of instructional practice utilized, time allotted for instructional practice versus time allotted for test preparation, and the influence of testing on instruction (Vogler & Carnes, 2014). Inquiry instruction has been viewed as an important model for science instruction for some time. Due to constraints placed on teachers, even though inquiry learning is the preferred method of instructional delivery, the more classical means of direct instruction dominates the classroom. This is due in part to the timing and content of the learning calendars utilized in various states and school districts as well as the type and style of questions that are a part of the EOCs. Teachers can either be a driving force for or be resistant to any changes that are implemented. Depending on how the teachers feel about enforced policies, they can exert an undue influence which can be perceived by both the students and administrators. For the teachers' part, they have few options; they can either apply the new policies and procedures or resist them.

Change Theory as a Framework within which to Investigate the Perceived Role of an EOC on Teachers' Perceptions of the Their Instructional Practices. Because the stakes for students, teachers, and administrators are so high, it is important to investigate how teachers perceive they have had to change their instruction as a result of outside forces like EOCs. Both the teachers and their students are acted on and are agents of change in this process. Change Theory provides a framework within which to investigate the driving and restraining forces that impact the change process. Change Theory simply states how changes in organizations take place. For this specific study, the organization in question is the high school, with teachers being asked to change their instructional practices due to the implementation of a high-stakes test, the EOC. Leaders and those with leadership roles play an important part in the change process in

schools. In fact, the shift in paradigm to an accountability movement in education has changed

the role of the educational leader. How leaders help facilitate change and guide those below them

is important to the well-being and sustainability of the organization of which they are a part.

Teachers' Perceptions on the Impact of EOCs and on Instructional Practices are

Important Because …   Teachers are the cornerstone of the American educational system. The

teachers' perceptions of how the EOC impacts their instructional practices can impact their

ability to communicate information in a manner that the students can retain. Scientific

knowledge can either be gained or lost in the classroom. This study investigates whether selected

high school science teachers whose students either are or are not subject to an End of Course

(EOC) examination perceive that their instructional practices have been affected by the presence

or absence of an EOC.

Chapter 3

Procedures and Methods

This chapter explains the methodology used in this study. It describes the study design and the specific procedures used. This study used a qualitative approach that was based in the conventions of phenomenological research. There are a number of reasons a qualitative study approach best fit this research. For one, qualitative research is sometimes referred to as naturalistic research, meaning that it occurs when subjects are observed or phenomena are explored in their natural settings (Wolf, 2015). Second, qualitative research often focuses on those questions, topics, or issues that can be difficult to quantify, such as human interactions and experiences (Wolcott, 2008). Finally, qualitative research often lends itself to the development of thick descriptions of the phenomena or questions being explored (Buller, 2016). This is important due to that fact that this research is a complex phenomenon that has different contexts which were believed to require greater detail in the analysis due to thicker narrative descriptions. In the case of this exploration of teachers' perceptions of how EOCs impact their classroom practices, the researcher sought a methodological approach to best explore the meaning-making that teachers made within their own work environment. Also, given the highly subjective nature of teacher perceptions and the nuances of those perspectives, qualitative research approaches fit the aim of this inquiry and provided an opportunity to develop thick descriptions of how teachers understood and perceived the impact of these exams on their own teacher practices. There are many types of qualitative research that may have been used to examine this topic, but the researcher chose a phenomenological approach as the main phenomena being explored here were the subjective perceptions of the participants. Simply explained, a phenomenological study is an approach to studying experiences of individuals and what happens in their lives (Wolf, 2015).

The following section provides a discussion of qualitative research and the phenomenological approach used to frame and construct this research. This chapter also describes procedural aspects of the study, including the site selection, procedures and rationales for particular site and participant selection, and the process of data analysis.

Study design

This study was designed to accurately represent and make meaning from teacher perceptions regarding the decisions, policies, and educational standards that were required by the Florida legislature in order to implement and utilize standards-based curricula and standards-based EOCs. In order to elicit useful responses from science educators in three different schools within a mid-sized central Florida school district, this study was designed to incorporate two different methods of data collection accessing teacher subjectivity, as well as school-wide data and classroom artifacts in order to help inform and deepen researcher meaning-making around the participants' subjectivity. In addition to providing a methodological focus of this study on perceptions that surround EOCs, this research process provided teachers with the opportunity to use their voices while expressing more general beliefs about their workplace and highlighted how policies and procedures imposed on teachers affected their ability in ways that affect their ability to instruct their students. From the most practical standpoint, this particular phenomenological study involved going into three high schools in a mid-sized school district in central Florida in order to learn more about the EOCs and their impacts on teaching and learning from one of the main two groups of stakeholders often left out of the conversation: teachers.

Initially qualitative data were collected in the form of written responses participants crafted in response to items in a questionnaire developed by the researcher. This questionnaire included items related to the EOCs and teacher practices. In addition, background demographic

information was solicited through these questionnaires. The questions were designed to elicit a response based on the individual teachers' experiences in both their school and school district as well as how their instructional practice might vary based on the administration of an EOC in their particular courses taught. Following a preliminary analysis of these questionnaire responses, the researcher selected nine of these participants and constructed a semi-structured interview protocol with open-ended response questions.

Qualitative research. Qualitative research is one of three types of research that is commonly used in educational research. This study was qualitative in nature due to the fact that it was designed to elicit, examine, and make meaning from the perceptions of teachers in order to better understand the impact of EOCs on their classroom practices. Specifically, the purpose of this study was to examine how high school teachers perceived their pedagogical practices – particularly when the courses they taught included the requirement to administer an EOC. The researcher for this study specifically focused on nine teachers from three high school science departments in one central Florida school district. Teaching is one of the more complex social interactions human beings can experience (Shook, 2014). The purpose of this study is to examine selected high school Biology teachers' perceptions about how their instructional practices have been affected by the implementation of an EOC in comparison to other high school science teachers who are not required to administer an EOC. Following the administration of the questionnaire to 30 teachers in the district the researcher focused more specifically on the perceptions of nine teachers.

Qualitative approaches are used in education research because they often provide detailed data and information that is deeper and more nuanced than many quantitative approaches which some have referenced as crunching numbers (Toy & Ok, 2012). Instead, qualitative research can

shed light on context, situations, or processes in questions that explore the complexities of human social interaction (Toy & Ok, 2012). The collection of qualitative data provides researchers with opportunities to examine human phenomena and the participants who experience them in systematic and disciplined ways. These qualitative data can provide detailed information about the phenomenon in question in ways that best represent the complexity of those phenomena and the meaning-making around those phenomena by participants themselves (Marshall & Rossman, 1994).

A qualitative approach best fit this inquiry intended to gain insight into the teachers' perceptions. As mentioned previously, these perceptions could be measured quantitatively; however, the research wanted to look at the lived experiences of these participants in their classrooms where they contended with how the integration of EOCs impacted their teaching. Qualitative research allowed the researcher to study the perceptions of the participants, gain knowledge about their lives, and then use the knowledge gained to formulate an analysis and develop findings and possibly even recommendations based on those findings that might transfer to similar situations with teachers and EOCs (Marshall & Rossman, 1994).

Phenomenological studies. Human perceptions are phenomena due to the fact that each individual person has a unique perception as to how they view the world. The perspectives are often layered and nuanced, rendering them difficult to understand from more quantitative approaches. The variation of qualitative research used by the researcher was a phenomenological approach. Simply explained, a phenomenological study is an approach to studying human experiences (Cilesiz, 2011). Taylor and Bogdan (1984) described the researcher, or phenomenologist, as one who "is committed to understanding social phenomena from the actor's own perspective. He or she examines how the world is experienced. The important reality is

what people perceive it to be" (p. 2). Phenomenological studies are best used when one wants to examine and represent the participants' life world and the participants' interpretations of their experiences (Lofmark, Morberg, Ohlund, & Ilicki, 2009). Phenomenological studies also focus on the discovery and meaning-making of and around phenomena by participants, which is then documented by researchers in rich, detailed ways (Gurol & Kerimgil, 2012).

One of the conditions for a phenomenological study is that the participants are questioned about very specific experiences, and the study must begin by producing a list of every interviewee statement that may be relevant to the experience (Lin, Groom, & Lin, 2012). The purpose of conducting a phenomenological study is to explore and seek to understand the experiences of people based on the subject that one is studying (Pinder, 2013).

The researcher chose a phenomenological approach in order to explore the personal knowledge and their subjectivity of teacher while honoring their voices, and interpretations (Kabilan, 2013). The research also used this approach to gain more insightful information from the participants as to why they chose to take certain actions such as representations of artifacts that the participants can bring as well as the choices that they make to their instructional practices (Moody, Kostohryz, & Vereen, 2014). This study looked at the teachers' own perspectives in the classroom and how the EOC relates to their ability to instruct their students. This is due to the fact that phenomenology is also a philosophy grounded in experience. Phenomenology focuses life-world experiences in their purest forms, often prior to any interpretation that those who live the experiences engage in. A phenomenological approach provides researchers and participants with opportunities to unfold and examine their experiences. By doing so, phenomenology allows us to view our experiences and the routines of our daily life

in focus and condensed ways (Weng & Lin, 2013). A phenomenological approach is best to learn about the how and why of an individual's choices.

Within phenomenology, there are several different theoretical frameworks that can be applied. The theoretical framework that worked best for this research is Grounded Theory. The primary reason the research selected Grounded Theory was the absence of a preconceived hypothesis. Instead, Grounded Theory provided the researcher with the structure needed to build hypotheses *in situ* (Johnson, 2015). The Grounded Theory is described in more detail in the section below.

Grounded Theory. A Grounded Theory approach focuses on developing and explaining a hypothesis in an iterative process often involving the participants themselves (Moss, Gibson, & Dollarhide, 2014). Some characteristics of Grounded Theory include the theory building process must be grounded in data, using an iterative and comparative data analysis method, and analytic memo writing by the researchers also seeking to understand their own subjectivity in the research process and its impact on meaning making (Heppner & Heppner, 2004). Grounded Theory often takes a narrative approach to collect data and analyze the data.   The overall purpose of Grounded Theory is to discover and construct the theoretical possibilities implicit in the data through inductive reasoning. (Liu, Englar-Carlson, & Minichiello, 2012; Varda, Shoup, & Miller, 2012).

Site Selection

This study encompassed participating teachers from the science departments of three high schools in a mid-sized central Florida school district. Located in the central region of Florida between the major metropolitan area of Orlando and Daytona Beach, these three school sites within the school district are approximately forty miles away from each other in rural areas. The

communities in which the schools were located had similar student demographics. The three schools would be considered rural schools. Collectively the three schools and their student demographics closely mirror the demographics of the school district. In the 2012 – 2013 school year in which data were collected, there were approximately 61,000 students in the entire school district. One school had approximately 1600 students, while another school had approximately 1800 students and the third school had roughly 2700 students. In total the difference was approximately 900 students (Volusia County School District, 2013). Each of the three schools that were a part of this study earned a B or a C grade for the 2013 school year. The researcher selected schools with a B/C ranking as they represent the average ranking of schools in the county at the time. The researcher believes that schools that are rated an A and those at the other end of the spectrum may have unique sets of circumstances that potentially would have skewed the data gathered. The researcher was looking for data with greater reach and more transferability to a greater number of schools. The researcher designed this study around teacher perceptions with the belief that such schools and such teachers would provide crucial perspectives on the EOCs in ways that would be transferable to other schools and other contexts. There were sixteen core science teachers at one of the three schools, seven core science teachers at another location, and eleven core science teachers at the third school.

Study Participants

The participants in this study were considered to be full and part time teachers of record as employed by the school district. Part time teachers were considered as participants in this research due to the fact that they would have had to have met the same requirements as full time teachers. The participants were identified in the employment pool of the school district by gender and ethnicity. The participants in this study were all members of their school's respective

science departments, which would include Earth Space Science, Biology, Chemistry, Physics, Environmental Science, Marine Biology, and Anatomy and Physiology, but excluded teachers from other fields such as Health Science Teachers or Agriculture teachers. The teachers were teaching at one of three different levels in their respective schools, either the general population, honors, or advanced preparation classes.

This was the first phase of the questionnaire, to gather basic demographic information about the participants. In this study there were 10 male and 17 female teachers. The age range varied from 22 to 52-plus years. The majority of teachers were Caucasians. The teachers held various academic degrees ranging from a BE (Bachelor of Education) to an MD (Doctor of Medicine) and four were part time teachers working toward their degrees. The teachers were at their current position for a varying number of years, ranging from first year teachers to teachers with 20 or more years at their respective schools. In total teaching experience at all three schools there was a range of experience from twenty-five years to first year teachers. The classes that teachers taught varied from Biology, Co-Taught Biology, Earth Space Science, Physics, Chemistry, Marine Science, Anatomy and Physiology, Environmental Science, and Astronomy. The class level varied as well from general population, honors, Advanced Placement, and Special Education Students (ESE). The classes' sizes varied but averaged 27 students per class and three teachers reported the total students that they taught at 180, 160, and 160 students. The majority of the students were classified as Caucasian, 70%; with smaller percentages of African American, 13%; Hispanic, 15%; Asian, 2%; and those classified as Other Nationalities, 1%, by the teachers. There was approximately a 1:25 teacher to student ratio in each school, with specialized, honors, and AP classes having a smaller teacher to student ratio, while general education classes, including core classes, had a larger teacher to student ratio.

Table 1: Teacher and Basic Student Demographic Information: Abbreviations: BE- Bachelor of Education, BS- Bachelor of Science, BA- Bachelor of Arts, ME- Master of Education, MS- Master of Science, PhD- Doctorate of Philosophy, EdD- Doctorate of Education, MD- Doctorate of Medicine, A&P- Anatomy and Physiology, AP- Advanced Placement, ESE- Exceptional Student Education

Gender of Teachers									
Male	Female								
10	17								
Age range of teachers									
22-27	28-33	34-39	40-45	46-51	52+				
3	5	3	6	5	5				
Ethnicity									
Caucasian	African American	Hispanic	Asian	Other					
24	1	1	1	0					
Degrees Held									
BE	BS	BA	ME	MS	PhD	EdD	MD (other)		
3	15	2	2	0	0	0	1		
Years at current position									
1-3	4-10	11-20	20+						
9	10	6	2						
Teaching Experience (years)									
1-5	6-10	11-16	17-22	23-30	31+				
8	9	3	3	0	3				
Classes Taught									
Biology	Biology Co-Taught	Earth Space	Physics	Chemistry	Marine Science	A&P	Envi.Sci	Astronomy	
7	3	7	4	4	2	2	4	1	
Level of Class									
General	Honors	AP	ESE						
26	17	5	3						
Class Size									
AVG	Total								
27	180	160	160						
Teachers reported Ethnicity of students (%)									
Caucasian	African American	Hispanic	Asian	Other					
70	13	15	2	1					

The participants that were interviewed were selected out of the above-mentioned demographic pool, based on their availability during their scheduled planning period. From the nine participants there were five men and four women interviewed, two of whom held the role of department chairperson. The nine participants taught a variety of classes: three taught biology and one additionally taught marine biology, one co-taught biology, two taught chemistry, and one taught anatomy and physiology.

Participant Selection

This study employed two non-random sampling techniques, purposive sampling and convenience sampling. Purposive sampling, as defined by Johnson and Christensen (2004), is when "the researcher specifies the characteristics of a population of interest, and then tries to locate individuals who have those characteristics" (p. 215). For the goals of this study only a specific population of teachers, that of high school science teachers, was purposefully targeted. The teachers were selected based on grade level.

Convenience sampling, as defined by Johnson and Christensen (2004) as utilizing participants who "are available or volunteer or can be easily recruited, and are willing to participate in the research study" (p. 214) was used for this study due to the logistical constraints often found in schools and for teachers, particularly during testing periods. Across the three identified high school sites, 34 teachers fit the participant criteria. However, some of these potential participants were unable to meet with the researcher due to constraints on their time. The researcher met first with 27 participants across the three schools during their regularly scheduled departmental meeting times, and with permission from both the school and district and principals of their respective schools. Notably, the researcher could only meet with the participants during specific timeframes that served as the teachers' planning periods. This

constraint had its origins in teacher union regulations holding that teachers could participate outside of the hours of school operation if they were compensated based on the payscale of the county. Since the researcher had determined that no monetary compensation would accompany participation in the study, all contact and interaction with participants occurred during school hours.

Participants were also selected based on additional criteria. The researcher determined that participants had to be science teachers in high school that teach the basic science classes, rather than teachers who work in a specialized academy. Although the level of teaching experience was not a factor in participant selection, the researcher was purposeful in recruiting at least a few first year teachers due to the belief they might hold unique perceptions about the EOCs and their impact on the classes they teach. Another selection criterion established by the researcher was that the school type had to be a state accredited public school in a Florida county school district, and not a magnet or charter school.

The researcher chose not to include teachers from either a magnet school or charter school. Magnet schools are by definition a specialized school and often contain courses and curricula that deviate from standard state curricula that exist in most non-magnet public schools. For example, magnet schools might focus on the performing arts, open structured class, specialty education (such for entry into a career for medicine or agriculture) and are more directed toward students entering the work force directly after graduation from such programs as career options and exploration programs (Parrillo, 2015).

Both purposive and convenience sampling techniques have their merits and detractions. For the purpose of this study the merits of the two non-random sampling techniques outweigh the detractions. The merit of convenience sampling is that this particular method is practical,

especially when considering the restraints and limitations of this study. The merit of purposive sampling is that only a specific population of teachers is being studied. The detraction of convenience sampling and purposive sampling is that it is impractical to generalize to a population on the basis of a single study (Johnson & Christensen, 2004). However the aim of the researcher was to engage in deep, nuanced meaning making with participants around their perceptions of EOCs and their impacts on teaching and learning in their classes. Thus, the particular contexts of these schools were integral to both the qualitative process of inquiry and subsequent results. Given this purpose, the researcher designed this process to provide opportunities to explore the common experience of EOCs within the idiosyncratic contexts of three schools and the 27 participants and nine participants at each stage of the study.

Research Protocols

This study was approved under the guidelines of the University of North Florida Institutional Review Board (Appendix D). This research study holds exempt status due to the fact that the participants were adults, they were not identified in this research, and this process was considered as part of their normal employment routine. As part of the University of North Florida IRB process permission was also sought and gained from the School District. The school district required a completed permission to conduct research form in order to gain access to the teachers and the schools they work in (Appendix E). Each principal in the three respective schools gave permission to enter the school and conduct research there. The final permission was obtained from the science department chairperson of each school, who also scheduled appropriate days to meet for introductions and to schedule interviews with individuals.

Data Sources

This research utilized three sources of data: a questionnaire designed by the researcher, teacher interviews and school and classroom artifacts. The reasoning for using three sources of data is that in applying questionnaires, interviews, and artifacts the researcher has the ability to triangulate the data provided and further strengthen this particular study. Triangulation of data involves the illustration of similar themes, statements, and undertones from different data collection styles and methodologies (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville, 2104). In research, there does not need to be three types or methodologies of data collection, but instead two or more methodologies are applied together in order to bring validation to information, points of interest, or themes drawn out by the researcher.

One source of data for this research was the questionnaire developed by the researcher. This was considered a primary source of data due to the fact that the information came directly from the participants. Data sources offer a reliable and valid means of determining or attempting to answer the question that the research is posing (Steinbrecher, McKeown, & Walter-Thomas, 2013).

The second source of data for this research was interviews. The main role of the interview was to get the real story from participants, which is conceived to be lying hidden beneath the platitudes of any group, and is inclined to discount heavily any expressions of the official ideology (Filstead, 1970). This was considered a primary source of data due to the fact that the information came directly from the participants. The source of this research came from voluntary participants who had been identified through the responses to the previous method, the survey. The source of data in this part of the study was a set of open-ended questions that emanated from teachers' responses on the questionnaire (see appendix A). Interview questions

delved more deeply into the basic questions of determining if the EOCs affect the teachers' instructional practices.

The final source of data for this research was artifacts such as classroom and homework assignments collected from teachers. These were considered a primary source of data, due to the fact that the information came directly from the participants. The source of this research came from voluntary participants who had been identified through their responses to the previous method, the questionnaire, and who were interviewed. The data in this study came directly from the participants as a part of their instructional practices and was a part of the participants' methods to assess student achievement in class, whether as a formative or a summative assessment. The artifacts provided by the teachers were analyzed as far as the content of the artifact and the types of questions or assignments and how it correlated to the EOCs.

Questionnaires. One method of obtaining preliminary qualitative data to be used to gather more specific and richer data is through the use of questionnaires. The questionnaire in this study served a purpose: to gather demographic data about the participants and to gather preliminary data used to format and create interview questions, to be used at a later time. In this regard, this questionnaire was used to inform decision making around the subsequent interview protocol and questions formulated in it along with assisting in the determination of participants from the interview stage research results in decision making, informed research and shaping public opinion as well as being used to formulate other questions (Barge & Gehlbach, 2012). This particular questionnaire (see appendix A) is set up by the researcher so that participants had to either circle a particular choice (as per age or gender), fill in a short write-in section in the demographics (such as estimated percent of student ethnicity) or construct open-ended responses (see appendix A).

Using questionnaires to collect demographic information provides a simple and clear structure for the researcher to learn about the specific background of the individuals in a study (Shedd, 2007). Additionally open-ended questions can also be a part of a questionnaire in order to solicit more detailed open-ended responses (Kern, Rivera, Chandler & Humpal, 2013). As described above, this particular questionnaire contained three types of questions: item selections, short fill-in responses and open-ended questions about the teachers' instructional practices and their own perceptions of the EOC. The questionnaire was designed using structured questions that elicited unstructured responses. These items were designed to generate responses that might inform the development of deeper, more pertinent questions to be delivered through an interview process at a later time. In this way the researcher developed a questionnaire that can be used to inform later iterations of the inquiry process (Dabic & Stojanov, 2014). The initial questionnaire items were modified based on interview questions from Pinder (2013). The design of the questionnaire format was intended to begin with broad questions that would generate responses that could then lead to more specific interview questions in this study. This was a paper questionnaire that could be completed using paper and pencil.

With available technology, questionnaires can be distributed by a variety of means. As a tool, surveys can be built on the Internet or sent by email versus the traditional paper format with handwritten responses (Jenkins, 2006). In this instance, as mentioned previously, the questionnaire was completed via paper and pen (or pencil) and submitted to the principal investigator. In this study the questionnaire had several items based on the sub-questions stemming from the main question of this research. The specific questions of the questionnaire can be viewed in the appendix of this paper.

One of the constructs used in this research was the use of a questionnaire that had both general response questions as well as open-ended response questions. The survey adhered to the following format. As a part of the first research question, teachers were asked a series of questions to determine the demographics of the two science departments. These questions about the demographics included age range, years of experience teaching, ethnicity, gender, highest degree and subject, number of years in the current school system, and previous occupation (if applicable). Next were a series of questions to survey the teachers on their experience with EOCs built from the work of Pinder (2013), as mentioned previously.

One shortcoming is testing the validity of the questionnaire. In order to have a valid survey, one must document the validity of an instrument to assure that the findings are adequate and appropriate to the type of research being conducted (Pike, 2013). Questionnaires are often not perfect, but there is a range of the quality of survey, and the research should always strive for the best fit. Questionnaires are often used as a "best fit," although not the perfect research tool. However, questionnaires are often the best means when dealing with real world constraints (Bertot & Jaeger, 2008).

Interviews. Interviews are often a method that is best applied with a phenomenological study. Interviews are typically done at the particular site where the research is being conducted. Due to the fact that research is based on phenomenological studies, that being the lived experiences of teachers who either administer an EOC, or those who do not, it made intuitive sense to interview the teachers in their work environment, i.e., classroom or office, due to the fact that this was the location where the teachers spent most of their time and where they would probably feel the most comfortable. Typically, interviews are more in-depth than survey questions and elicit a response from the participants, leading to a richer insight into the

participants' experiences (Johnson & Christensen, 2004). For this research interview questions were built based on the responses from the previously submitted surveys. As stated by Taylor and Bogdan, "the in-depth interview is modeled after a conversation between equals, rather than a formal question and answer exchange" (1984, p. 77). The interview questions were designed based on the responses provided by the participants, and in one instance based on current information broadcasted to the public by a local news outlet. The interview questions were based on the descriptions of good interview questions by Losch that will be discussed later in this section of this paper. The specific interview questions can be found in the appendices of this research paper. Interviews have a wide range of data collecting possibilities. Interviews can either confirm or contradict information previously known, or interview data may also add an alternative perspective on the information provided. Interviewing participants gave the researcher a chance to discuss changes in greater detail while allowing for reflection by the participants (Marshall & Rossman, 1994). During this process the participant answered a series of questions (see appendix A for questions) in a setting that they are accustomed to, either their office or classroom, whereas the interviewer was a guest. As a guest and visitor of the school, the researcher conducted himself in an appropriate fashion, knowing that he was imposing himself on another's time.

Interviews are a key area of any phenomenological study. Interviews should be designed to gather detailed information. One important area of conducting interviews is the development of open-ended questions, but there is a trend to ask simple "yes/ no" questions, which may or may not lead to a deeper understanding of the topic (Leasure & Sanches-Fowler, 2011). There is also the temptation for the researcher to indicate agreement with the participants in an attempt to create dialog (Leasure & Sanches- Fowler, 2011).

The design of the interview had several follow-up questions to the initial survey. These interview questions were structured as such: Could you tell me a little more about that? Is there anything else you would like to mention? Why do you think that is so? Which answer comes closest to how you feel? Do you lean more toward one side or another or do you have an alternative to each (Losh, 2013)? There were also questions allowing the interviewee to make any other comments about this research topic.

The main role of the interview was to get "the real story" from participants, which is conceived to be lying hidden beneath the platitudes of any group, and is inclined to discount heavily any expressions of the "official" ideology (Filstead, 1970). This was considered a primary source of data, due to the fact that the information came directly from the participants. The source of this research came from voluntary participants who had been identified through the responses to the previous method, the survey. The source of data in this part of the study was a set of open-ended questions that emanated from teachers' responses on the questionnaire (see appendix). Interview questions delved more deeply into the basic questions of determining if the EOCs affect the teachers' instructional practices.

The merit of interviews is that the interview provides a rich substance-based explanation about the phenomenon that is occurring in talking about their experiences. The participants have a "voice" with which the landscape of the problem at hand can be synthesized, and the interview can show the participants' involvement (McKenna & Millen, 2013). An interview is also viewed as a natural source of inquiry (Frels & Onwuegbuzie, 2013). The interview process allowed further insight into this particular field of inquiry.

Artifact Collection. Artifacts were also collected from these teachers. Items that were considered artifacts were tests, assignments or any other type of assessment. Artifacts are items

that are gathered as means of alternative comparison. Artifacts, as described in this research, included tests, assignments, or any type of assessments that were distributed by the teacher for student completion. Collecting artifacts from the teachers built a stronger case for why and how teachers make accommodations for the EOC as a part of their instructional practice. Some teachers did not have any examples of student assignments, whereas other teachers had several different assignments that were easily accessible. Due to the nature of and quality control guidelines of the state and district, copies of the exact EOC could not be provided, nor were past EOCs available. Having artifacts from teachers allowed for the triangulation of the surveys and interviews, as well as the artifacts, in order to draw stronger, more meaningful conclusions. The artifact collection stage of this research generated only a very small snapshot of some of the tools that a teacher uses, and some artifacts such as standardized tests are kept with strict guidelines as to their use and are not divulged until a certain time period after the test. There were also indications that teachers adjusted their teaching and assessment, focusing more on multiple choice questions and using similarly phrased question styles to match those found on high-stakes tests (Huddleston, 2014).

As the researcher is a former teacher, the participants for the most part felt comfortable enough to provide class material. The material provided did not have any student identifying marks, but were blank documents. The final source of data for this research was artifacts such as classroom and homework assignments collected from teachers. These were considered a source of data, due to the fact that the information came directly from the participants. The source of this research came from voluntary participants who had been identified through their responses to the previous method, the questionnaire, and who were interviewed. The data in this study came directly from the participants as a part of their instructional practices and was a part of the

participants' methods to assess student achievement in class, whether as a formative or a summative assessment. The artifacts provided by the teachers were analyzed as far as the content of the artifact and the types of questions or assignment and how it correlated to the EOCs.

There are several merits to questionnaire-based, interview and artifact collection research. The merits of survey-based research are that due to the fact that no identifying voice is recorded there are fewer concerns about the preservation of confidentiality, paired with the correspondingly higher rate of completed responses and finally being generally more accessible to groups with limited financial resources and time constraints (Perkins, 2004).

The merit of the collection of artifacts is that there is evidentiary proof of what the participant does in the classroom setting. In collecting artifacts from teachers, the main key is to look at different points of emphasis that the teacher places on the assignment based on the EOC. The document would show what material/learning strategy/teaching strategy is being implemented to that particular standard. The artifacts would show emphasis based on accountability, tone of the leadership (i.e., Principal/Assistants), pressures of the county/state (based on standards), personal interests, and overall educational climate of the school (Soltani, 2014). These artifacts showed three varied things that relate to the standard being taught: learning strategies, the students' understanding of the material presented by both the teacher and the student, and a means of assessment (Drake, Land, & Tyminski, 2014).

Data Collection Procedure

The data collection procedure of this study consisted of meeting with the teachers during a normal after-school meeting time that had been previously scheduled with their respective department heads and scheduling interview times. The study was explained as follows: Just as in

other areas of education, the teacher is at the forefront in the classroom. This study took into account the teachers' perspectives about the EOC and their instructional practices based on whether they administer an EOC. It was mentioned that due to various circumstances and situations, it is possible that classroom teachers have little voice or say in determining what is to be taught, nor are the teachers given an opportunity to voice their own opinions about the administrative procedures imposed on them. The purpose of this research is to examine science teachers' perceptions regarding the EOC in public schools in central Florida. The importance of this research is to allow teachers a chance to voice and possibly express the difficulties encountered in the classroom as they attempt to adhere to the prescribed standards and procedures. The importance of EOCs, along with a frequent change of instructional practice, can lead to frustrations from areas outside the classroom. The focal question that this piece of research focused on was that of the teachers' perceptions on the administering of an EOC. The approach taken in this piece of research involved on-site interviews with science teachers from three mid-sized public schools in a central Florida school district. The interviews were based on teachers' perceptions of the science standards and how they teach in the classroom based on the EOC. This research is important due to the changing standards and the aspect of teacher accountability.

A verbal and written presentation of letters of consent was given. It included the following points: participation was voluntary, and there was no compensation for being a participant in this research (appendix C). After the introduction and the letters of consent were filled out, a brief survey was distributed to the participants that consisted of general response questions as well as open-ended questions. Only if necessary, a meeting would be planned for the following month's normally scheduled meeting in order to give the participants time to

review their answers and make any changes or corrections to their previous statements, and to update the participants on the progress of this research. One month after this second meeting the data, as well as a rough copy of the research, were given to the department chairperson to review.

Consent forms were filled out and kept as records in accordance with the policies and procedure in place at the University of North Florida. The consent form stated that the participants need not be a part of this research, but that their identities would be kept anonymous as to who responded and who did not respond. Participants were also informed that at any time they could choose to no longer participate in this research. Participants would be allowed to view what had been transcribed and could, at any time prior to publication of this research, change or retract any part or all of their statements.

After the presentation the teachers received the questionnaire. The provided questionnaire was based on questions about determining the demographics of the science teachers (See appendix A). The questionnaire, in addition to self-reported demographic information, also had open-ended questions. The purpose of the open-ended responses was to provide the researcher with some basic background material as well as to be the basis of in-depth interview questions. The responses from the questionnaires along with guiding research (mentioned previously) led to the development of the interview question. The rationale behind the questionnaire was to gain some general insights about the EOCs and how those particular high-stakes tests affect the teacher, or if the teacher does not administer an EOC, how they conduct their class. In two instances the questionnaires were completed in one trip to the high school (done during the after-school meeting) and in one instance the questionnaires were dropped off during the morning meeting and the teachers filled the questionnaires out when time was available to them throughout the day and the completed forms were picked up in a large envelope at the end of the

day in the main office. The reason for the interview was to acquire a more detailed response and to hear more about the experiences of the teachers. This interview was scheduled with the teacher according to the teacher's own availability, preferably directly after school or during their planning period. The interview was no longer than forty minutes, so as not to overly burden the teachers during their planning periods. Interviews were taped and then transcribed at a later date. In conducting the interviews I visited the schools for a second time, this time just to meet with individual teachers for a one-on-one interview session during their planning period between classes. The teachers that I met with had an open time which they could spend being interviewed. The interviews were a straightforward set of prepared questions created from the initial questionnaire responses. The list of interview questions was loosely based on the work of Howley, Howley, Henning, Gilla and Weade in 2013. Having this 'conversation' with the participant allowed for a greater amount of human interaction, including a feeling of acceptance, and a participant learning more about their own field with the prompted interview questions (Marshall & Rossman, 1994). During this time, the participant was asked for some examples of assignments, lesson plans or tests (artifacts) that were then compared with those from other participants and were compared and contrasted to each other in order to determine what aspects were similar and what aspects were different and why there were differences between those teachers that administered an EOC versus those teachers that do not have a required EOC. Specifically, the artifacts collected from the teachers included lab worksheets, individual teacher's quizzes, journal articles that required reflection for the students, and practice guides. Copies of the artifacts were organized by three categories, factual information, inquiry style learning techniques and open-ended responses. Copies of the artifacts can be found under their organizational theme in the appendix (F) of this paper. The artifacts collected from the

participants, added to interview session, exhibited any possible changes that teachers had made to their instructional practices based on the impact of the EOC.

As a credibility check, a generic draft of the findings was given to each department chairperson to gather their feedback before the research was submitted for finalization. A general acknowledgment thanking the teachers (without mentioning any identifying characteristics or identifiers) was placed in the final section of the submitted draft. This is a limitation that the researcher faced; after the initial meetings for the questionnaire and interviews, all other communication took place with only the department chairperson and was limited to communicating via emails. Another limitation was that the research took place during the end of the school year and it was not possible to contact any of the teachers during or after certain dates.

The one area of concern was to set aside time that was normally used in the science department monthly meetings and to be sure that the surveys were not overly long or tedious for the teachers to fill out, so as not to prolong the allotted time for the department meeting, and to place as little burden as possible on the teachers for their cooperation in this study. This study, however, was an opportunity for the teachers to voice their own opinions about the educational system in the state of Florida.

Role of the researcher

A researcher takes on many different roles during a study. Not only is the researcher tasked with the completion of the study, but other integral parts of the study as well. Some of the tasks that a researcher undertakes are networking, collaboration, managing research, doing research, publishing research, and evaluating of research (Kyvic, 2013).

As a former teacher in the school district in the county in which this research is conducted, I had a unique role and position in this research. As a former teacher I had an inside track in order to gain access to the schools that participated in this research. I also feel that I had a greater connection with the teachers due to the fact that at one point I potentially would have been a member of their science department in their school. Possibly from the teacher's perspective I was not a true outsider but at one time I was a part of the small 'fraternity' of teachers in the school district. This unique position as an outside researcher with a familiarity with the district from my previous work experience within the school district, I feel, led to me having greater credibility with the teachers. This could have been due to the fact that for my working time in the school district (at a different school) I was also subject to and exposed to many of the policies that the current teachers are dealing with. Another aspect of being an insider conducting research is that the teachers know that as a former teacher I too dealt with students, administrators and on occasion parents, so teachers knew that I had similar experiences that they had.

Not only does the researcher perform outside tasks, but the researcher becomes a part of the research as well. This is true of qualitative studies in which the researcher interacts with participants. This is especially true if the researcher at one time was a part of the community or group. This "insider" research occurs not only when the investigators study themselves, but also those like themselves in a similar profession, their family or their community (Wilkinson & Kitzinger, 2013). When researchers place themselves in a position in the community of which they were once a part, it is important that as a researcher one limits his or her own voice and lets the voices of the participants become the focal part of the study, not just a reiteration of the researcher's own opinions, but to gather opinions from an outside source. An investigator must

consider how each of the strategies that are outlined deals with issues of power and the "voice" that is to be represented in the research project (Wilkinson & Kitzinger, 2013). One methodology to deal with the "voice" of the research is minimize one's own "voice" and let the "voice" of the participants be the highlight of the participatory study. The best way to minimize the "voice" of the researcher is simply to ignore it and to make no attempt to represent the voice of the investigator or to influence the research (Wilkinson & Kitzinger, 2013).

In this research as the principal investigator I was formerly a teacher at both the middle and high school levels. As with most professions and as mentioned before, this would be "insider" research and would be a distinct part of academia. As a former teacher this investigator occupies a different career niche than do classroom teachers (Kennedy-Lewis, 2012). One important issue to define is what kind of relationship should be developed with the participants, as the former "insider," now with a different role, becomes an "outsider" (Kennedy-Lewis, 2012). A former teacher, the principal investigator left the teaching practice and has entered the research field. This is one common area within the field of teaching. It is not uncommon for former teachers to leave education and turn to research; in fact, former teachers compose one of the larger groups trained to perform educational research (Kennedy-Lewis, 2012). Even though the researcher was once part of an educational institution, the process that one undergoes to become a researcher in the field is reflected in the subjects they choose to study. Reflection by the researchers on their subjects contributes to highlighting the way in which previous professional experience is worked through, deepened and transformed in the encounter with a scientific research perspective (Franke & Arvidsson 2011).

The role of the researcher and, more importantly, the relationship that the researcher develops with the participants is important. As a former teacher in this school district there were

unique relationships formed with the participants. In taking a look at the depth of the relationships between the researcher and participants, a complex and holistic vision of development, making good research models, and gaining insightful information from both parties occurs (Torres & Baxter-Magolda, 2002). In regard to the researcher, the individual should be knowledgeable about the subject and the methodologies used. In the preparation of a well-thought-out study the researcher is required to be well-versed in the critical and cultural scholarship that enables an assessment of their use and results (Rakow, 2011). Another aspect of the research is that the individual must have certain goals and practices for their study. Researchers must be intentional, self-reflective, and transparent in decisions about the purpose, design, execution, and interpretation of results of their projects to themselves, their participants and finally to the reader (Rakow, 2011).

Data Analysis

The data analysis of this section was divided into several different parts. Each part of the data analysis provided a clear understanding of the process as well as ensuring the validity of this study.

Step 1. Entering initial demographic data

After the questionnaires were collected the first step was to enter the initial teacher demographic data into a spreadsheet program in order to organize the data. The second part of the data analysis was to make a list of general comments about the demographics, including the calculated averages, number of years of experience, and other demographic data. Along with the teachers' demographic information, the students' demographic information, as provided by the teachers, was documented. After the surveys were collected the first step was to enter the initial student body demographic data into a spreadsheet program in order to organize the data. The

second part of the data analysis was to make a list of general comments about the demographics, ethnicity of the students, average student grades and other student body demographic data. This information was available from the county, but the information from the teachers gave much more specific data.

Step 2. Initial reading of questionnaires

After all of the surveys were collected, the surveys were read by the researcher. The unit of analysis at this stage was the responses to the questions from the questionnaire. The responses were then analyzed for emerging themes. It was possible to have more than one theme come from a response. The researcher began to make a tentative list of themes emerging from the responses. As similar responses were read, the specific responses were placed into preliminary categories. Copies of both the questionnaires were made in order to further organize the questions into themes and were coded. My understanding of what the participants wrote was checked for accuracy as a part of the verification step.

Information from the questionnaire was used to develop questions for the individual interviews, for example, as themes started to emerge from responses around the issue of time management in replies from question 6: "Have you had any challenges to your instructional practice due to any instituted practices?" A more specific question with specific language led to interview questions: Why do you think of the idea that EOCs in Florida are fast-paced, and some might say Florida may need to remake the required standardized tests? As a science teacher, what is your feeling on this? What do you think your students feel about this? This question was formed due to the majority of respondents writing about the pace at which their class is set, due to pacing guides and curriculum maps of the county.

Step 3. Individual interviews and artifact collection

After the initial reading of the questionnaire responses and analysis for themes, such as the idea of having time constraints or teaching to the test, a more detailed list of interview questions was developed. An example of a questionnaire response interview question would be "this was mentioned in the initial questionnaire; can you expand upon this idea?" As previously mentioned in the reading through of questionnaire responses, the interview questions delved deeper into specific areas and common themes that arose from the initial questionnaires. In chapter 4 there will be a discussion of themes that emerged from both the initial questionnaire and that of the interviews and artifact collection

Artifacts were collected from the participants. These artifacts were any works that they had readily available to them such as lab sheets, quizzes and tests, and worksheets (see appendix F) that were collected to see if there were any differences among the participants. The artifacts were separated into three distinct categories of teaching practices and assessment as presented previously in the literature review and further explained through Bloom's Taxonomy, that being of factual information, open-ended responses, and inquiry learning. In some instances when students are asked for factual recall, that is the lowest of Bloom's Taxonomy, having the least cognitive load on the students, therefore questions that are asking for recall with either a word bank, matching or multiple choice would fall under the knowledge domain of being factual (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Each one of the categories increase cognitive complexity in activities in science education dealing with knowledge recall and experiential, inquiry-based scientific thinking, as well as laboratory-based assessments. In this study multiple choice/ matching/ true false quizzes and tests are considered factual recall, some labs and activities where students had to read through and answer questions based on manipulation are trending toward inquiry learning and finally, presented topics where students

had to rationalize their answer are referred to as open-ended responses. This accomplished by reading through the assignments to look for key aspects of the three classifications (for this particular study). Key phrases were then quoted in the results section based by classification. The three classifications of artifacts that are in this research were developed through a review of the literature and are further explained in the results section of this paper. Copies of the artifacts themselves can also be viewed in the appendix (F) of this paper.

Step 4. Coding of copied data

After the data was copied, the copies of the surveys were coded in such a fashion that each question could be matched to the original survey. A numeric value was attached to the original document and the same numeric value was assigned to all of the written questions on the copy of the survey. The copied data was cut up and the responses were placed on a board underneath either the specific questionnaire question or interview question. The original data was kept intact in case the researcher had to go back to it to check some item. This was done in order to analyze all of the data provided by the teachers in either the questionnaire or interview to see the overall number of common statements and to see if there were any outlying statements made during either process. The coding of the copied data was done by grouping phrases said by the participants that had the same or similar words and verbiage. An example would be the phrases 'teaching to the test' or 'instructing to the EOC' or 'preparing for the EOC' would be placed in one grouping based on a majority of similar phrases (approximately ¾ of respondents). Another example of a theme could be the "time constraints" that the teachers who administered an EOC had to deal with, whereas those teachers that did not have an EOC did not have a specific deadline to meet, but instead had to conform to the pacing guide of the county. Ideas

that emerge in both the literature and as a part of the interviews are then triangulated along with the responses from the questionnaire and artifacts collected.
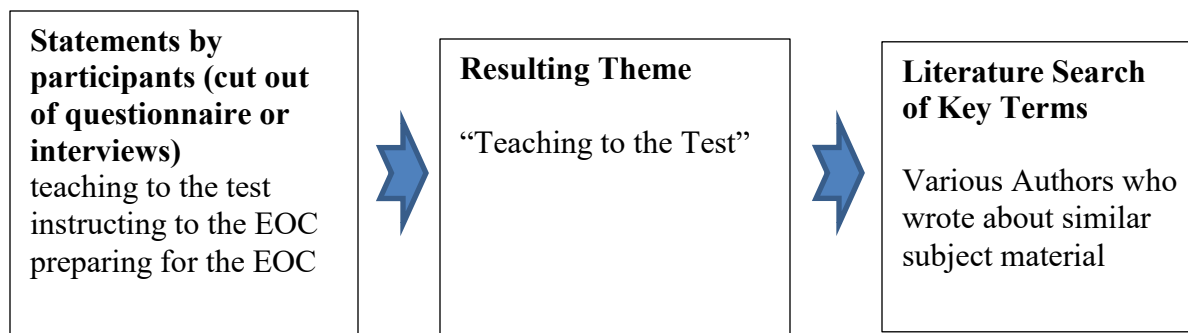
| **Statements by participants (cut out of questionnaire or interviews)** teaching to the test instructing to the EOC preparing for the EOC | **Resulting Theme** "Teaching to the Test" | **Literature Search of Key Terms** Various Authors who wrote about similar subject material |

Figure 2: Flow chart on the research and development of themes and triangulating them to the literature

Step 5. Organizing the responses and drawing out common themes and contrasting themes

With the responses under the heading of the corresponding question, all of the responses were read and overall common themes in the form of similar phrases and wordings were created from the data. Also, during this step if there were any responses that contradicted the overall common theme, they were also placed under that specific question. The list of specific survey questions, overall common themes and their direct responses, as well as the contrasting themes and their responses were reviewed by the researcher as an initial check, and then rechecked by the department chairperson of the high school. Any contrasting data was still managed under the theme that it was diametrically opposed to and in the results section for that particular theme, a subheading would be that of contrasting ideas. The idea of contrasting ideas stems from the fact that not all of the teachers who filled out the questionnaire or who consented to an interview did not teach a class with an EOC, and some teachers who taught multiple classes being either required to administer an EOC or not to may have a difference of opinion about the classes and state that. It is in this step that the researcher began to connect or triangulate reoccurring themes from the three different data sources, the questionnaires, interviews, and artifacts.

Step 6. Verification

On a pre-arranged second visit to the schools the participants were given their responses and asked if there was anything they would like add. The participants were shown what had been generated at that particular time. During this visit any clarifications of spelling or grammar were addressed. Member checking is an integral part of qualitative research. Member checking is one technique that is used to validate a researcher's findings (Roberts, 2010). In this particular research copies of the data in the form of the required after-research report were submitted via email to the corresponding science department heads for their feedback and verification of the validity of the statements of the teachers under them. It is important to note that the report had the compiled data from the three schools where the questionnaires and interviews took place and that none of the participants were mentioned by name or given any identifying characteristics or descriptions as a part of the research to protect the participant and to keep them anonymous to each other. An email was sent to both the principals of the three schools as well as the school's respective department chairpersons, who were asked to pass it along to the participants. There was minimal feedback (i.e., "looks good", "seems right", "thanks").

Step 7. Finalization

At this time all of the data collected and sorted was finalized by the researcher. As a part of the permission to conduct research with the school district, a report was submitted to the head of the school district based on the results of this research. A copy of the initial report was presented to the researcher's advisor for review.

Summary

This chapter has provided the information necessary to justify the general methodological approach to this study, provide a background on the methodology used as well as give the specific details as to which types of instruments were used to perform this research and how they

were used. Specifically, as stated previously, this research is qualitative in nature with a focus on phenomenology, taking a look at the lived experiences of the teachers at their high school and how it relates to their ability to work in the classroom setting based on whether they are required to administer an EOC or not. The materials that are used in this research that follow a phenomenological study are a questionnaire to gain some preliminary insight into the experiences of the teachers, more in-depth interviews based on the responses to the questionnaire and finally, when possible, the collection of artifacts that teachers used in instruction of classroom material. This section also provided information as to the site selection and the selection of the participants. As mentioned previously, this study was done on site at three high schools in a central Florida mid-sized school district, examining the experiences of those particular high school science teachers from their respective school's science department. Based on the material gathered from the participants, the following chapter delineates the comments made by participants and any other information gathered from the participants from their school. The next section is an examination of the data collected from the participants and analyzed based on the research design.

Chapter 4:

Results

The themes that were developed and described for this section came from four different

data sources: the questionnaire, interviews, artifacts, and analytic memos. The questionnaires

posed general questions to a larger group of participants and initial themes as well as interview

questions were formed based on the responses. The interview questions were based on responses

gathered from the questionnaires and delved, with greater detail and depth, into the initial themes

as well as other emergent themes that grew out of this process. Artifacts consisted of classroom

activities, non-county quizzes or tests or any other printed assignments. Artifacts were collected

and analyzed for common trends in the type and style of questions and or activity that was a part

of the teacher's current instructional practice. Copies of the artifacts are included in the

appendix of this paper (F). The themes that emerged from this research were then placed under

the heading of their respective research sub-question as well as being identified by which source

of data that they came from as well as whether the participant administered or did not administer

an EOC.

The overriding research question for this study is: What are the perceptions of selected

high school science teachers whose students are subject to an End of Course (EOC) examination,

as well as those whose students are not subject to an EOC?

The specific research questions are:

1. What are the science teachers' perceptions about how the presence or absence of an EOC

affects their instructional classroom practices?

2. What are the science teachers' perceptions about adaptations to their instructional practices, if any, in areas such as pacing of instruction, assignments (artifacts such as quizzes, labs or other assignments), curriculum maps or other instituted practices?

In order to answer these research questions, the researcher distributed questionnaires, conducted interviews, and collected artifacts from teachers. This chapter includes the responses from the participants as well as a description of the artifact(s) that the teachers provided. Additionally, this chapter includes the responses broken down to the two specific questions of this study and then under each question are themes that emerged from the participants' responses.

Research Question 1. What are the science teachers' perceptions about how the presence or absence of an EOC affects their instructional classroom practices? Three themes were identified from the participants' responses to this research question. Each of these themes represent important factors on how participants believed the presence of an EOC affected instructional classroom practices. These themes representing perceived impacts of the EOCs on classroom practices were adherence to curriculum map, time constraints, and increased professional pressures due to heightened emphasis on teacher accountability.

Adherence to the Curriculum Map. The first theme identified from the data based on questionnaires, interviews and assignments was that regardless of the presence of an EOC, teachers expressed adherence to curriculum maps. Although this adherence to curriculum maps extended across the differentiation between non-EOC and EOC courses, such adherence had different perceived outcomes and impacts on classroom instruction. One such impact, explored more thoroughly in the next theme, was the compression of time that occurred when EOCs need to be administered.

One of the themes that occurred as a result of instructional time aspect of teaching in a particular subject in the Florida public school system is following a curriculum map. A curriculum map outlines the specific sub-fields of an academic subject as wells as provides a timeline in which the specific sub-fields are to be taught. The curriculum map often coincides with a pacing guide. The initial questionnaires contained participants' expressions which focused considerably on their school district's curriculum map. To a degree, the emphasis also showed in some of the assignments that teachers expected their students to complete.

The majority of responses of teachers who do not administer an EOC spoke favorably about their adherence to the curriculum map to pace themselves. For instance, one non-EOC participant wrote, "My lesson plans adhered to a district curriculum map that aligned to the *Next Generation Sunshine State Standards* (*NGSSS*)." Another participant who did not administer an EOC stated that such adherence was helpful particularly in light of shifting standards. This participant wrote, "As the standards changed, there was more specific content to cover and we had to adhere to the curriculum map more closely than before." Non-EOC administering participants frequently described their general adherence to their curricular maps, using phrases such as "I covered the material put forth in the curriculum map" and "Following [the] plan map as a minimum goal and teaching those more as time and level allow."

In addition to the loss of instructional time due to the administration of EOCs, some participants expressed a belief that pressures to focus some instructional time on test preparation and test-taking strategies also hindered their abilities to follow their curriculum maps. EOC administering participants also identified great value in using curriculum maps; however, due to the loss of instructional time that they described occurring as a result of EOCs, they communicated difficulty using these curriculum maps effectively. For example, one participant

who administered an EOC described both the value of a curriculum map as well as the challenges in following it as a result of the EOC: "We follow the curriculum map. The sheer number of standards requires that we stay as close to the prescribed pacing guide as possible. We must touch on all the standards, as this is an EOC course and they could be tested on them. It leaves very little time for depth and re-teaching."

Based on the analysis of the data there appeared to differences in the instructional depth in the classroom between teachers' practices who administer and who do not administer an EOC. Teachers who administer EOCs expressed having fewer opportunities to engage in varying instructional practices which could potentially lead to richer and deeper learning opportunities. One such EOC teacher said, "I try to align all of the instructions and activities to the current standards…for every activity I look at what the students get out of doing it and is it worth the time since there is so much to cover in such a little time." This quote exemplified the perspective shared by many study participants who administered an EOC regarding the calculations they felt forced to make regarding whether more in-depth instruction was worth the time spent departing from an already constrained timeline that accompanied their curriculum maps.

In contrast, non-EOC participants did not express such constraints. Teachers that do not administer EOCs focus more on benchmarks and standards. "Some Common Core strategies have been incorporated into some lessons, but overall I have changed very little." Some fields of science have not changed over the course of the years. "Since I currently teach chemistry there have not been many new additions to my curriculum." During the interview sessions the curriculum map was also brought up. "It is difficult to complete [progress] and the time limitations are not fair to either the student or the teacher."

Participating teachers who did not have EOCs felt that they focus exclusively on content coverage based on the curriculum map, as opposed to EOC teachers, who felt that they had to cover curricular content in a reduced time but they had to address general test teaching strategies and make sure that the students are on the ground level. It all depends on the textbook selection. In regard to testing, one EOC teacher stated, "It seems more important to have someone in class to give advice and to answer questions than to teach." As a part of the teachers' responsibilities, they need to cover the material that is a part of the standards due to the fact that the information will be tested. Chemistry and Physics teachers need to cover the required material as presented by the standards and the county's curriculum map.

Time Constraints. Time constraints play a major role in instructional practices. Participants in this study who were required to administer an EOC described a heightened sense of time constraints compared to their non-EOC administrating peers. In a world that did not have strict time measurements, there would be no need to have clocks or calendars, but that is not the world in which we or teachers live. Teachers have always had limited time to cover curricular content. Sometimes these limitations have originated from their own planning, sometimes they are put forth by the school district and in this era of heightened school and teacher accountability, these time limitations often come from the state. As mentioned previously, curriculum maps serve to assist teachers in contending with the time limitations affiliated with their courses. Built into the timeframe of the school year is the previously mentioned idea of the curriculum map. With the limited classroom time available to teachers for instruction, one area of concern for teachers who administer EOCs would be the days and time that eat into the schedule that are set aside for testing. From the interviews one EOC teacher felt that the change of standards made a significant impact based on time. "[It was] a bit more

difficult with time constraints on assessment time." This is caused by a faster pace, which another EOC teacher added to in their interview by saying, "The class is faster paced, the tests are mostly district tests and [it] is harder for them to show proficiency by only 'doing' the work."

The pacing guide has time constraints that the teachers felt hindered their ability to prepare students for the EOC. With this in mind, teachers are pressed to cover the material but feel that they do not have adequate time to review any material with which students might be having difficulty. During the interviews, one department chairperson who teaches an EOC class said, "It seems to be a lot of rearranging of the same standards. Some courses have had so many standards added that it is impossible to cover all" and continued to mention that "Like normal, I'm sure this is the 'next best' thing to come along until the next best thing comes along that taxpayers' money can be wasted on." During another interview with an EOC teacher it was mentioned, "There was a rush to get the material in before the EOCs." This sense of being rushed forces teachers to keep pace and forgo any type of review.

Teachers have mentioned that there is just such a sheer quantity of the material to cover that at times it can be overwhelming. This was perceived by EOC teachers due to the idea of time constraints from EOC testing dates cutting into instructional time; as one EOC teacher mentioned, "There is so much, but good lesson plans are core. With this kind of a schedule there is not enough time to for the students to learn the material and barely enough time to teach." Due to this rapid pace and the frequency of tests, teachers are under pressure to prepare their students for the EOC. Yet another EOC teacher wrote on their questionnaire, "The frequency of the tests; the tests are way too frequent. It literally goes test – test –test. With the frequency of the tests and the number of tests, it feels that I have to take half of class time for testing." Some feel that the pace is too rapid. An EOC teacher wrote, "District Assessments are too quick; there

is a unit concept that happens every three days. After that one day is set for a review and the next day is the test. There are eight to nine assessments a year, and during the year I spend two-four weeks getting the students ready for the test. With this kind of schedule there is not enough time to for the students to learn the material and barely enough time to teach. The one big factor is that the material goes in depth and is not for every student based on what the student needs to complete High School." One biology (EOC) teacher expressed on their questionnaire how teachers focused more on how lesson plans and curriculum maps guide them to the culminating EOC. "The curriculum map is subjective to the order of what is taught and the emphasis. Biology is organized differently. It should be based on what kids come away with; they don't necessarily need to have all concepts down. One idea would be to have tiered levels, college, tech school, not to learn everything but [is] what to be taught in a general fashion. A lot of students get caught up in the details at different tiers." This idea of limiting what information is presented to students was reflected in one interview with an EOC teacher. "I have to restrain myself from teaching some things due to MAPs. MAPs is what you teach to within the time allowed. I feel too constrained. It is also hard because I find myself saying why should I not teach basic additional information, or slow down the pace if I need to?" In the questionnaires an EOC teacher mentioned, "[It was] a bit more difficult with time constraints on assessment time."

This idea of constraints is not only time-based but also material-based. The idea of being constrained by the curriculum map is also mentioned in the questionnaire. Summarizing many of the non-EOC teachers' written comments, there is just enough time to teach the material and standards required for students to have some level of success on the EOCs. "[The] County has very detailed curriculum maps that were developed from the NGSSS. It is very easy to teach the required standards if you follow their map, but there is only just enough time." One EOC

teacher during the interview process went into some detail about the test schedule. "There are some types of mandates that the state tests. There are nine (9) district exams and an EOC; sometimes there are six (6) district exams and an EOC. No, not here, there is an accountability issue and with so much together, nine (9) is better." The teacher explained in greater detail, "I use the curriculum map as a guide as to what to teach and when. [It] depends on the class; we have too many diagnostics or tests that must be taken [and it] seems like they come every two weeks."

The number of tests and the constricted teaching schedule affect how and what the teachers teach. EOC teachers mentioned making choices between instructional options, with one teacher writing, "Teaching has to be sacrificed in order to do all of the testing." Some other teachers expressed similar thoughts on the questionnaire: "[Things that are] sacrificed [are] time, flexible scheduling [and] re-teaching time" as well as "The pacing makes it difficult to go in depth for any topic."

In contrast, only three teachers, all of whom were non-EOC teachers, mentioned in the questionnaire that they had no difficulty with the change of standards, with one teacher stating, "We have a district chemistry curriculum, which we follow closely." As a follow-up another chemistry (non-EOC) said during the interviews that there was "No change, there has not been a need to adjust. I should be able to change if need be. The good thing is that Science is easier than other subjects. Science is science."

Even though some teachers brought up valid concerns, one EOC teacher said during the interview that the pacing of instruction did not have any relevance to the performance of the students on their EOCs. "The majority of the students are so indoctrinated that the pace is to be expected. They are not overly concerned about the tests as long as they pass the state tests. In

some aspects the pace is too quick because there is too much on specific exams. The students

are not worried about what they are learning, more so on the tests. The students use test

corrections as a crutch to retake the tests. With the High School, nothing much is different."

Even though teachers are trying to adapt to the EOCs, the pace of instruction makes that

difficult. One EOC teacher said in the interviews, "I find myself constantly changing, mainly

trying to improve, and that is not really for the sake of the students but to have the students know

everything that they need to know about the EOC. I go less in depth, less sharing of new

discoveries with students. With these new EOCs I can't cover 70% of the material I need to,

much less covering everything 100%. It does affect the students' confidence levels when they

take the EOCs."

A department chairperson gives some greater detail, during the interview, of the

difficulties of the curriculum map, while preparing his students for the Biology EOC. "It's not so

much with the students, but as a teacher we must be more selective in what we teach and that is

tied to the benchmarks, with most of us following the curriculum map. It is time consuming. I

know from the student's perspective the EOC is the big ticket item and that comes one month

before the end of the school year and some items, such as blood flow, are not included in the

instruction, nor is the heart or circulatory system, and the students had to take the test without

knowing about those topics. It is difficult for a new teacher and without access to a *Professional*

Learning Community (*PLC*), some new teachers can get lost. What students have to learn is that

the textbook is a tool, a reference, and is not covered cover to cover. I know that other states

face the same difficulties with their exams; New York State has the Regent's exam that only

covers certain topics. In Florida the students are getting the experience of writing with lab

reports and some other assignments but the state test is still multiple choice. It would be good

for responses but so far it does not model students' academic performance. [Courses, such as] Bio 1 follows this function, while Bio 2 is a different story, with no standards, and the writing aspect is different. This also varies between classes and levels. Bio 2 and AP Bio are college level and those go by different assessments and work with the College Board."

    Accountability. One newer idea mentioned in the literature review is the idea and process of teacher accountability. Specifically, as referenced in greater detail in the literature review, teachers are held accountable to cover the material set forth by the school district as mandated by the state. The EOCs are one measure of a teacher's ability to cover the required material over the course of a set time span. This idea of accountability is then transferred to the teacher's job performance review and has the potential to impact both a teacher's salary and employment status. When mentioning teacher accountability during the interviews there were a variety of responses. When asked whether the county should dismiss the EOC, based on what other school counties have done, the EOC teacher stated, "The county should refuse to take part due to the fact that the district is test crazy. When we would get rid of the tests, we would gain six more weeks of instruction with no test preparation. As far as it relates to teacher evaluation, that's malarkey. They keep changing the tests anyway. Very simply the job is to have the kids take the tests."

    Non-EOC teachers have the perception that their overall performance in the class is reflected in their evaluation, not just the one EOC. To this point the non-EOC teachers, specifically those who taught chemistry, said when building and giving feed into building regular tests (versus EOC), "We pore over the test specs to make sure we are covering everything and to the depth the state requires." Furthermore, one teacher wrote in the questionnaire, when asked as

to what is required as a teacher, "I make sure I complete at least what is required of me to ensure my position as a teacher."

As far as long term goals go with *NCLB,* which was signed into law by President Bush in 2002, all students should be performing at academic grade level by 2011, but the 2010 results show that not all were at the level. In an interview with a department chairperson who teaches Biology (EOC class) he went into great detail about the accountability issue, mentioning some of the data that is collected by the county. "I feel that we need to set reasonable goals for students and I'm wary that the new system will scare away new teachers. It seems those who make the standards have a certain mindset, but reality is different. It just seems that every five to ten years there is a different system. In the past the curriculum map was bad; now it's better, but new teachers still have difficulties with it and they need more time to train for it. We here are very data driven, from administrators to teachers, and we always want to see some type of progress. It is also very competitive from school to school and county to county. With that being said, all schools and counties monitor the progress of the sub-groups and create goals to address the sub-groups. Our school is a rated a B school. We monitor every chapter in Bio 1, and we are tracking those constantly. The number of students I have is relatively low due to the fact that one (1) year it was not offered but we want an increase of 10% in goals per year. Now with the summative, those are district driven and are made of 25 questions which are standards-based and are multiple choice. This is linked to a benchmark and it is based on subject. Sometimes the language is different because there are also formatives and diagnostics and those assessments are assigned a certain value but the diagnostics don't count toward the student's grade."

Summary. Although it would not be considered a major theme drawn out, during the entire survey and interview process, it was noted that the teachers who took part in this research

had some closing statements about their own teaching position. In some closing statements

being prompted at the end of both the questionnaire and the interview, when asked if there was

anything else that they would like to add, with everything previously being considered,

especially with the teacher accountability factor, most teachers (EOC and non-EOC

administering) thoroughly enjoy their positions. This sentiment was expressed both written and

spoken as "I do enjoy it and I hope to see changes during my time but I can still teach the

material." Even though there is some trepidation as to what is to come, "I am concerned with

what is to come; it seems to be the calm before the storm" and the teachers do enjoy and feel

satisfaction with their work: "Nope, love teaching." Within this section the prominent items

drawn forth are that of adherence to the curriculum map, time constraints that teachers face and

the concept of accountability for both the teacher and the student.

Research Question 2.

What are the science teachers' perceptions about adaptations to their instructional

practices, if any, in areas such as pacing of instruction, assignments (artifacts such as quizzes,

labs or other assignments), curriculum maps or other instituted practices? Three themes emerged

from perceptions regarding adaptations to instructional practices: teaching to the test, lower

grades/academic performance, performance with EOCs (fact-based), and performance without

EOCs (inquiry-based).

Teaching to the Test. EOCs have caused a unique phenomenon in the education system,

which is to teach to the test. Teaching to the test brings about unintended effects of teachers

covering testable material in a very specific fashion, more related to direct instruction than

inquiry learning. One prominent theme that has been brought up by this research is the idea of

"teaching to the test." This concept was mentioned by several teachers, prominently EOC

teachers, in the questionnaire when asked what source they teach to and why. With EOC teachers, teaching to the test is a dominant issue in their instructional practice. This idea was reflected in the writings of one Biology (EOC) teacher. "[It] seems that they want us to teach to the EOCs (tests)." This is due to the fact that Biology teachers are required to administer an EOC. Some teachers even admit to teaching to the test. One EOC teacher wrote, "Biology has a state EOC that we teach to." And specifically, "We have EOCs so we prepare for students to be successful." And "Biology teaches for the EOC; that is our goal, to make sure the students pass the EOC." Even a department chairperson who teaches biology says, "If the test is a valid measurement of the student's knowledge of key course content and skill, then teaching to it is."

Two other teachers felt that the test assessed student knowledge and was used as a measure of student performance in the classroom. "I do not think that this would happen, but it should. The state tests are not [an] impressive way to test student knowledge. Way back the FCAT had much more emphasis on testing. It is for student appearances." "There is not a lot of support for testing, not so much as anti-testing sentiment, but we have to test. There is the pressure to teach to the test. Students' performance is linked to the test. Yes, it would not surprise me."

Without the additional pressure of an EOC, teachers instruct based more on the standards and the material than constantly preparing their students for the EOC. One of the Chemistry teachers said during the interview, "As a former AP (Advanced Placement) Physics teacher and *National Board Certified Teacher* (*NBCT*), I have been working with the standards for many years."

In contrast teachers who have no EOC have a different ideology on instruction. There is a difference in the methods of instruction used by teachers who do not teach a class that has a state EOC or test. The majority of those teachers teach to the standards. Some teachers gave very

straightforward responses on their questionnaire: "I teach the standards listed in the curriculum map." And "[I] always teach to [the] standards."

One Biology teacher tries the additive effect of the two ideologies of teaching. During her interview, when asked to expand upon this idea of what is being taught to in the classroom she said, "I teach to the district standards and district standardized tests." Some teachers, both EOC and non-EOC, include teaching to all three teaching practices: "I believe we teach all three. We teach the standards, which incorporate the subject, which will help them take the EOC."

One older, male chemistry teacher had a more unique approach. "I teach the material. My subject does not have an EOC or FCAT section." One chemistry (non-EOC) teacher mentioned during the interviews that his students are taught how to learn. "I teach the subject. My job is to prepare them for college and to be lifelong learners."

Lower Grades. Students are typically assigned a grade for most forms of completed work, either based on a numerical scale (100-0 or 4-0, depending on school and grading policies) and/or an alphabetical grade (A, B, C, D, or F). Most schools require students to maintain a certain grade level to measure the completion of a course or as a successful exit requirement. This section will look specifically at assignments and possible reasons why teachers that administer an EOC and those teachers that do not administer an EOC in the three visited schools have the perception that students are earning lower grades, overall, in their classes. A non-EOC teacher wrote "…Students have more problems passing the tests [due to the fact that] tests have more weight and many students struggle with achievement on tests." While answering the questionnaire another non-EOC teacher notes, "New district policies due to Common Core may have lowered grade distribution slightly, but partially because students are not used to some of the new policies and they [the policies] keep changing… [There] are a lot more Cs and Ds and

less As and Bus, even in my honors classes." The one non-EOC teacher who mentioned that there was no change in grade distribution also continued with the following comment when followed up in the interview: "I do not think that the changing standards have impacted grade distribution to any significant degree [but] district grading policy changes have had a major impact in this area." Even though EOC and non-EOC teachers have the perception that grades are decreasing, Biology (EOC) teachers stress the importance of the EOCs more so than the change of standards themselves. One Biology teacher noted on the questionnaire, "Grades have overall declined since the EOC was implemented." Another wrote, "I don't feel that the standards changes have had much of an effect. The standardized tests have had a bigger impact."

One concern held by an environmental science (non-EOC) teacher as brought up in the interview session was that "Less students complete projects, present projects, etc." while another EOC teacher's concern was "As an example for AP, it is not a high level of math in science but the students need to plot points and make increments on a graph. Some cannot do this and this is a concern. They also need to be able to interpret graphs and to be able to make use of graphs. They also need to be able to calculate and to use concepts." This same Biology teacher said during the interviews, "Students choose not to do the response questions and choose to take the hit in their grade. For the students coming into high school it is a culture shock; they have to take notes, the vocab is at the end, not the beginning, there is the lab before the notes. They have to learn how to use notes and are often pressed for time."

Specifically when asked during the interview the environmental science teacher's observation on one class assignment that he elected to share was "There was an attempt to incorporate 'Class Reading.' That did not go over well."

In specific science fields students feel apprehensive about assignments. One Earth Space and Chemistry teacher related during the interviews, "With Math, there are no true math standards in Earth Space Science, but there are some math standards in Chemistry. It does seem to be harder on lower track students; they just don't seem to be comfortable. Now there are the data lists that students have to make up the formatives which make up 40% of the grade and then there are labs and vocab." An ESE teacher who co-teaches biology also brought up this point in the interviews: "Students choose not to do the response questions and choose to take the hit in their grade." To some extent, the lack of student motivation is tied to the curriculum map and the teachers' attempts to add instructional practices to raise EOC scores. The same ESE teacher previously mentioned continues, "There was a lot of read-through material and some students are not able to do that due to their reading ability across the board. Specifically with *Exceptional Student Education* (*ESE*) students, all of the reading question results were all over the board; some students with emotional issues had difficulties. Some were difficult for students to be successful with due to their attention span." An Anatomy and Physiology teacher, although a non-EOC class, but who works within the biology department said during the interviews, "Within the county there have been new ideas, [like] *Sentence, Lines, Answer, Mechanics, and Support* (*SLAM*) by Schaffer. The county has also been pro-development; developing reports on how well these new strategies work. It is more the use of teaching strategies and less [emphasis] on material. SLAM is to teach students how to read and how to pull out information, similar to T123C (Writing Strategy). With lower level students it helps, but upper level students find it boring. It's also like Short time - Long time reading (reading strategy). Really it's the same, it's just called something different. It has dumbed down the material for the students and a lot of students lose points in class by simply not doing it."

Teachers, especially Biology teachers, during both the interviews and questionnaires and backed up by the type of assignments given (more detail on the artifacts in the next two sections) stress the importance of the EOCs more so than the change of standards themselves. One Biology teacher noted during the interviews a direct relationship between the EOC and grades of the class. "Grades have overall declined since the EOC was implemented. I don't feel that the standards changes have had much of an effect. The standardized tests have had a bigger impact." Other EOC teachers found that due to multiple considerations, including the tests and the change in standards, students appear to be doing worse than previous years. There is more of an impact felt in lower level classes. The ESE teacher who co-teaches biology said, "Lower level classes are doing worse; [there is] too much information [and] too little time. [With] special education standard diploma students who are level 1 or 2 on Florida Comprehensive Assessment Test (FCAT) reading…[Their] grades will fall in the C and D range."

The biology teacher who co-taught biology gave a unique perspective. "There was a lot of read-through material and some students are unable to do that due to their reading ability across the board. Specifically, with ESE students all of the reading question results were all over the board; some students with emotional issues had difficulties. Some were difficult for students to be successful with due to their attention span. The questions were longer, but the test in composition was shorter. There was a rush to get the material in before the EOCs. Students would pass tests in a random fashion, but not the EOC assessments. I think there still needs to be a refining process, which would in my case include curving adjustments. The diagnostics, mainly EOCs and district tests, were not good across the county. The frequency of the tests is normal, but more go to length, and due to the length some students 'give up' on the test. The students that I have, have trouble letting go of questions that they cannot answer. There need to

be standardized traits in the tests; allowable times to take the test are vague; there need to be standards set to that."

With EOC – Fact Based. This type of assessment is the simplest format of the assessments mentioned in this research. Fact based assessments are typically short questions followed by a series of choices. The teachers that were interviewed were able to provide a simple quiz or short test in order for the researcher to analyze the type and format of the questions that they asked their students. Due to strict controls that the county has on distributing the EOC, exact examples could not be shared, but in this style and format, there were EOC-like questions on this assessment.

An example of this would be an EOC review from a different county as practice. After the students accessed the website, the directions were simple. This example came from a Biology teacher. "Record your responses to the example question in the space provided" and "Check your answers and review the provided explanation as needed." The students then filled in a corresponding letter for the answer in a typical standardized test format, either A, B, C, D, or E.

For another assessment/quiz, from a Biology teacher, the teacher provided a picture of a cell drawn on the paper with various cell organelles labeled and a word bank with appropriate choices for that particular cell structure labeled A, B, C, D, or E. For this particular quiz a Scantron© sheet was handed out and students were required to use a number 2 pencil and to fill in the appropriate circle to answer the given question. On this particular assessment the science standard designation, on formal NGSSS, SC.912.L.14.3, was also placed on the top of the quiz. There were two parts to this particular assessment, one being a picture identification, the second being that of terminology. An example of a question from terminology section was: "What

organelle releases energy for metabolic activity in cells? A) Chloroplast, B) Mitochondrion, C) Ribosome, D) Vacuole".

In another class, the teacher provided a slightly different formatted test. The subject was "Unit 4: Population Ecology, Form A." In a fashion similar to the previous example, the teacher left a space for the student's name and class period. This particular test had twenty-two multiple choice questions. One example was: "Which of the following only includes biotic factors? A) Ecosystem, B) Habitat, C) Biosphere, D) Population." This exam also included three short response questions for which students had to write in the correct answer but there were no choices or word banks. An example of the write-in question was: "List 4 limiting factors that affect the carrying capacity." A space was provided for the students to write in their answer. On this particular exam an extra credit question was also asked. "What is the definition of *fecundity*?" As with the short response questions from the previous section, space was allotted for the students to write in their response.

Non-EOC teachers, as a method of assessment, also used this practice of fact-based questions, but in much lower frequency. Another teacher (non-EOC) provided a section quiz based on ocean tides. This assessment had two sections – matching and multiple choice. The matching section had five terms and the student had to match the term with the corresponding answer by filling in either A, B, C, D, or E. The multiple choice section also had five questions. An example of the multiple choice section was as follows: "The tidal current that flows toward the ocean is called… a. an ebb tide, b. a flood tide, c. slack water, d. a tidal bore." The students would write their name, class and date at the top of the paper in the space provided and be allotted a certain time to finish the short assessment/quiz.

From an environmental science class, a typical exam was provided. The exam had the title of the class, the subject material on the test, in this particular case "Spheres and Cycles", and the exam form, "Form A." Beneath the heading were spaces for the student's name, period and date. For this exam the students had to circle the correct answer. An example of a question from this exam was: "The tectonic plates are a part of the A) Deposition area, B) Lithosphere, C) Hydrological cycle, D) None of the above." This particular exam had twenty-five multiple choice answers and four choices per answer.

This is also demonstrated by the level of questions asked on this type of assessment. One Biology teacher, also serving as the department chairperson, went into some detail about the development of the quizzes and tests on the questionnaire. "The formatives, which are common assessments, used to be only level 1 questions; now [they] go up to level 2 and level 3 on the tests. Very simply, level 1 questions are facts, [at] level 2 there is some explanation needed and level 3 typically includes graphing, pictures, reading and analysis."

Teachers that instructed based on the test stated that their reason was due to the importance of the standardized tests. A biology teacher mentioned during the interviews that in the construction of tests and quizzes ideas and similarly phrased questions found on the EOC was on the test and or quiz. "In our classes that I have experienced, there are tests that are standardized. There is an EOC that is cumulative that factors heavily into students' overall grades." "I have always followed the standards so any test given comes directly from questions about standards."

All of the teachers, whether teaching an EOC or non-EOC course, mentioned in the questionnaire an integration of academic subjects in their assignments. Specifically one Biology teacher wrote, "Math and English, the students do not realize it if those two are being integrated

into the assignments. Good science pools everything." And one Chemistry teacher wrote, "Language Art, primarily for writing, and Math is included in Science. This is part of the cross-curriculum aspect of teaching science. In math you have to read and interpret graphs. Working in standards from Language Arts and Math is a continuation of skills that lead to success with basic working skills in multiple career fields. The students see that as a payoff and [it] is more readily seen with immediate results."

Writing is also an important aspect of the teachers' assignments. A chemistry teacher wrote, "With science there is the writing aspect, seen mainly in the write-up of lab reports and looking up information in the literature. The aspects in math would be to be able to graph and to calculate. These are not at a high level, just the basics. As an example for AP, it is not a high level of math in science but the students need to plot points and make increments on a graph. Some cannot do this and this is a concern. They also need to be able to interpret graphs and to be able to make use of graphs. They also need to be able to calculate and to use concepts."

Without EOC – Inquiry-Based and Open-Ended Response. Inquiry-based and open-ended responses typically involve higher cognitive process, information sorting, and analysis. In contrast to the factual based assessments used by the majority of Biology teachers in this study, Chemistry and Earth Space Science teachers had a wider range of assessments, consisting of inquiry-based and open-ended writing assignments. An example of an inquiry-based assignment provided by a chemistry teacher was an activity entitled *The Bare Essentials of Polarity*. This activity was designed to help students further understand the concept of polar molecules and the interaction that those molecules have. The students first read a comic book about polar bears and penguins, which in this scenario represent polar molecules. To follow up the brief reading, a list of questions was distributed to the students for completion. The questions required a written

response, but no choices of possible answers were given. The set of questions to be answered was comprised of definition questions, interpretation questions, explanation questions, and descriptive questions. As mentioned previously, these two types of assignments are the assignments that the students had some difficulty with and in some cases did not hand in at all, or only handed in partially completed work.

In a different guided inquiry activity provided by a different chemistry teacher, students were instructed to complete a bonding activity worksheet. In this activity, students had to describe and analyze the bonding between two different molecules and compounds along with identifying the symbol and number of the cation and anion, along with the chemical formula. Not only were students responsible for completing the charts provided, but they had to answer some basic questions such as "Do nonmetals form anions or cations?" and "List 4 properties of ionic compounds."

The chemistry teacher also provided a review sheet consisting of two parts; the first part will be described in this section and the second part will be described in the next section. In the first part, the questions were primarily explanation questions. The two explanation questions were "Explain how the two different bonds in the diagram below contribute to the formation and/or properties of water" and "Briefly describe each property of water in the table below and explain why the property is important to living things."

A third guided inquiry assignment provided by the same chemistry teacher previously mentioned reinforced the concept of naming ionic components. In this assignment students had to build and name a variety of ionic chemical compounds. The types of questions from this assignment were identification questions, consideration questions, explanation questions, and descriptive questions. An example of an identification question was: "Identify three elements

that form only one cation." An example of a consideration question was: "Consider the ions of potassium (K) and sulfur (S). Write chemical formulas for all possible ionic compounds involving these ions, using the simplest ratio(s) of potassium (K) and sulfur (S). Keep in mind that the sum of the charges in an ionic compound must equal zero." An example of an explanation question was: "Explain why a 3 to 2 ratio of ions is necessary for the compound zinc phosphide." An example of a descriptive question was: "Describe the most obvious differences between the names in Model 3 and those in Model 2."

In an Earth Space Science class, one teacher assigned a "Graphing the Atmosphere" assignment. Based on this assignment, students had to read and interpret a graph and answer some follow-up questions. For the second part of the assignment, students were given numerical data and then instructed to make a graph based on the data provided.

A marine science teacher provided an entire chapter of the workbook that was used in conjunction with the textbook. This workbook chapter included a variety of sections. One unique feature that the workbook assignment had was a pre-chapter question that students were to answer before reading into the material: "What is the first thing you notice when you look at a globe? Earth has been called 'The Water Planet'. Why do you suppose that is?" From that one overriding question the chapter review continued to a reading section along with follow-up questions that included explanation, interpretation, and identification questions along with mathematical calculations about each particular section. An example of an explanation question was: "Review the terms and their definitions in the Mini Glossary above. Choose a term and write a sentence in which you provide an example of that item." An example of an interpretation question was: "Interpret scientific illustrations; what are the two most solids dissolved in ocean water?" An example of an identification question was: "Name three important gasses found

dissolved in ocean water." An example of a mathematical calculation was: "How much pressure would a scuba diver feel at 40 m?"

Although not predominantly used, inquiry learning assessments were also used by the biology teachers, when appropriate and when time allowed for it. In one class, the biology teacher provided an activity used in her class called "Oh Deer!" This activity was published as part of the *Project Wild, K-12 Activity Guide* and was sponsored by the Council for Environmental Education and the Western Association of Fish and Wildlife Agencies (1992). With "Oh Deer!" the "[s]students will: 1) Identify and describe food, water, and shelter as three essential components of habitat; 2) describe the importance of good habitat for animals; 3) define 'limiting factors' and give examples; and 4) recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change." In the "Oh Deer!" activity students were required to keep track of the number of 'deer' over a period of time and possibly make a table or graph showing the changes. Some of the follow-up questions for the activity included: "Name three essential components of a habitat," "Define 'limiting factors.' Give three examples" and "Examine the graph. What factors may have caused the following changes?"

During the interviews the teachers who were asked to briefly explain the instructional process and how it can be justified in the classrooms know of both timing issues and applying them to the curriculum map. The Environmental Science teacher said during the interview, "The students need to have the basics, that of math, which some do not have, [and] English, for writing and creating lab reports. Some assignments that I give include 500 word essays and it has to be formatted in an MLA format. When I gave out the article less than a third of the students read it and half turned in their assignment. Some submitted a response by just

paraphrasing the article, but they could not answer the basic question of what is your opinion."

He mentioned this as well as "Some cannot do this and this is a concern. They also need to be

able to interpret graphs and to be able to make use of graphs. They also need to be able to

calculate and to use concepts." This was based on a second open-ended response assessment; a

different teacher provided an article titled "The apocalypse has a new date: 2048." After reading

the article, students were required to "write (a) paragraph on your opinion; how do you feel

about this?" This open-ended response assessment gave students a chance to formulate their

own opinion about relevant subject matter that was being taught.

When asked about their instructional practices one biology teacher mentioned in an

interview, "I'm doing all I can do. I just make sure that the students are on the ground level. It

all depends on the textbook selection. It seems more important to have someone in class to give

advice and to answer questions than to teach." It is important to note that teaching is not just

about the type of assignments a teacher creates or how they prepare their students for a test. One

teacher probably put it best: "I teach the subject. My job is to prepare them for college and to be

lifelong learners."

Some teachers have self-assessed their own students and plan accordingly. A biology

teacher mentioned during the interview "It is changed all the time so some students get

frustrated. I tend to give the tried and true assignments. Some include Oh Deer; I also formatted

lab templates, visualizations with color and frameworks."

To illustrate this, one biology teacher provided a SLAMS worksheet which was used in

conjunction with the lesson that was being presented. SLAMS is an acronym for "State part of

the question and your answer in the first sentence. Locate evidence from the text to support your

answer. Add additional evidence or your own analysis. Make a meaningful conclusion or

connection." On the worksheet each of the letters, along with its meaning, was placed in a box on the left side with boxed-off space on the right for student responses. At the top of the paper is an open box, a place where students can place their name and other pertinent information such as class, date, and other information that the student might need in the heading. For this assignment there were no set answers and students were required to write in responses.

Summary. Teaching to the test, lower grades and Fact Based learning with the teachers who administer an EOC affect teachers profoundly, impacting their overall teaching style, whereas teachers who do not administer an EOC do not face the same concerns and whose instructional practices are inquiry-based.

Constructed Theory

When introduced to the lived experiences of teachers one quickly determines that there is no one perfect teaching practice based in part on the challenges and reality that surround the teacher. As imperfect human beings, teachers are often held to standards that could never be realistically obtained. The EOC is just one measure of performance in the classroom but it is often the only unit of analysis for some teachers. The practices of teachers are complex and teachers often adjust to the criteria assigned to them. Due to the singular nature of the EOCs, the results of this particular test, primarily the effects it has on teachers that administer it, are magnified beyond its constructed purpose. The unintended consequences are that teachers have the perception that the EOC has led them to teach to the test due to time constraints while following a strict curriculum map that has forced them to change their teaching strategies from inquiry learning to direct inquiry and even though the cognitive load placed on the students is lessened the results are in contrast to the expected, producing poorer performing students.

As an analogy, one can imagine viewing a small gemstone through a jeweler's loupe. If there are flaws on the gemstone, those defects, although minor, detract significantly from the stone's value due to its small size. There is little a master jeweler can do to remove the blemish from the gem without completely ruining the gemstone. In contrast the same small imperfections would hardly be noticed on a gemstone of a much larger size, due to that stone's sheer volume. A master jeweler could polish off or even cut the small deformity and still retain the gemstone's value due to the size of the stone. The teacher who administers an EOC can be likened to the jeweler's small gemstone and the results of the EOC are like the small flaws, while the teacher who does not have to administer the EOC can be likened to the large gemstone with its value determined by a broader criteria. The EOC is analogous to the small gemstone due to the fact that, as previously mentioned, teachers and teaching practices are not perfect, but with the one myopic view the flaws are perceived more readily. This is in contrast to teachers that are assessed in a more general fashion which is the larger stone, where the imperfections of teachers and their instruction are not perceived in one small view but fall and dissipate into the background.

As demonstrated through the questionnaire and interview response, as well as the collected artifacts, due to the significance of the EOC and the weight placed on the result of that test, any constraints that the teachers face that were highlighted in this study such as time constraints, following a strict curriculum map, and accountability issues can affect their teaching practices and result in teaching to the test and relying on direct instructional methods. This ultimately leads to the contrasting effect that having a low order cognitive load should have, resulting higher test scores.

Teachers that do not have the singular, defining event such as the EOC have a much broader array of instructional methods at their disposal. Therefore, teachers who do not administer an EOC, even though they follow a curriculum map for their subject, do not feel or succumb to the pressure of teaching to the test, and utilize more open-ended responses as well as inquiry learning as evident by the types of assignments collected. The accountability standards for those teachers that do not administer an EOC are different and include broader criteria than for teachers that are judged by the sole test.

With quality instruction and a decrease in student cognitive load for students, the effects of the EOC are opposite of what would be expected. This leads to the paradox in that the EOC at one time was intended to focus teachers more on specific content area and the timing of instruction, relieving the burden of planning and timing out lessons but instead had the unintended consequence of adding stressors to teachers who had the responsibility to administer an EOC. This idea of pacing teachers can be construed as a way to lessen the burden on teachers, allowing them (the teachers) to focus solely on classroom instruction but the participants, especially those who administer an EOC, placed perceived constraints on their delivery of the instruction to their students, having unintended consequences of placing perceived undue stress on both the teacher and students. Unintended consequences of an EOC are present in the teachers' perceptions regarding the themes that emerged from this research, those being staying within the curriculum map, feeling the pressure of time constraints, having the need to teach to the test and simplifying the types of assessments used, along with noticing the decline in grades have compelled teachers to work within narrow constraints to due teacher accountability concerns and often instead of compelling teachers to work with the system they stray further from it.

Chapter 5:

Discussion

The final chapter of this paper brings about a discussion based on the results uncovered by the researcher. This chapter is divided into several sections. The first area of discussion is to link relationships in this study to what is currently known in the literature. In this section the results found under each of the two research questions is compared to what was previously recorded in the literature, in an attempt to determine if the results lie along the same lines as the literature suggests, or if the results contradict the literature. The next section of the discussion ties the results to implications in regard to practice, the built theory and policy applications. Next, limitations to this are addressed. The following section discusses future research possibilities built off this paper. The final section includes some concluding remarks about this particular piece of research.

Relationship between study themes and existing literature

In this section of the discussion an attempt is made to triangulate the developed themes found in this study to the statements made by the participants and what is known in the literature. This was done by separating the two research sub-questions and highlighting the themes as uncovered from the results section and linking those particular themes to literature that previously exists, not specifically on this topic, but on a similar topic. A figure highlights each section with the resulting themes from abbreviated participant ideas and linked to literature sources.

Introduction. The following represents a discussion of the two research sub-questions, each with the developed themes that were uncovered by this research. With each corresponding sub-question, a figure represents the triangulation of ideas: participant's response, underlying

themes, and what is known based on the literature. The two sub-questions then tie into the

constructed theory as proposed in the results section based on evidence from both this study and

the literature.

Research question 1. What are the science teachers' perceptions about how the presence

or absence of an EOC affects their instructional classroom practices?

Themes
Time Constraints
Curriculum Map
Accountability

Surveys & Interviews
More difficult with time
constraints
Lesson plans adhered to
curriculum map
A lot of read through
material
The need to have some
means of accountability

Literature Based
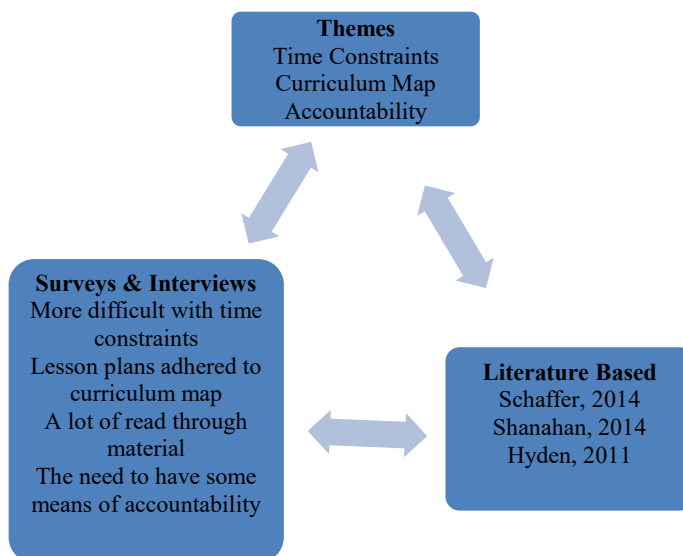Schaffer, 2014
Shanahan, 2014
Hyden, 2011

Figure 3. Graphical triangulation between themes, responses from the survey and interviews and
the literature for the first research question

Main themes that stand out from the responses to the first research question are the ideas

of time constraints and adherence to the curriculum map, along with the idea of teacher

accountability. These two themes recurred throughout both the initial surveys and the

interviews. The two themes have also been referenced in the literature with other similar

research topics.

In taking a look the responses from a philosophical point of view, one can examine the

problem about education that the philosopher Immanuel Kant brings up. One issue concerning

educators for the past 200 years has been the feeling of restraint (Schaffer, 2014). "Kant writes,

'One of the greatest problems of education': 'How am I to develop the sense of freedom in spite

of the restraint?'" (Schaffer, 2014, p. 5). This idea of being restrained due to time constraints was demonstrated in both the surveys and the interviews.

In the surveys it was mentioned that the responses follow what has been previously mentioned in the literature. Pacing guides are key to best aligning a teacher's lesson plan with the standards (Neher & Plourde, 2102). Due to this concept of a pacing guide, often teachers feel the need to omit certain lessons from instruction that would provide students with a richer, fuller understanding of the material being taught. A pacing guide is used to help teachers in their planning and to guide teachers as to what material is required to be in the lesson plan and which lessons had to be omitted due to the timing of the pacing guide (Neher & Plourde, 2012).   This can be seen in the literature as well. For students to perform at a required level, their skill set needs to be developed over time so that they can read increasing amounts of text without guidance or support, while making sure the texts are rich in content and sufficiently challenging and having students explain their answers and provide text evidence supporting their aims (Shanahan, 2014).

A second theme emanating from this research question is that of adherence to the curriculum map. The curriculum map is a guide used by teachers to lead their instruction of the material. As described in the literature, a curriculum is the topics taught and the books or materials used, along with the framework or instructional approach adopted by a teacher, school, or district (Griffith, Massey, & Atkinson, 2013). The literature points out several topics that were reflected by the participants in this research. In taking a look at the curriculum map from a different academic subject, that being the field of mathematics, specifically the topic of algebra, there were some inconsistencies between the curriculum and the standards, which led to a variety of issues that teachers had to deal with. In one state, each algebra state standard was

addressed. In this particular study it was found that some standards were identified as missing in the curriculum, which then caused some difficulty with the teachers due to the fact that they needed to be aware of standards that were missing from the curriculum and supplement their lessons while still keeping pace with the curriculum map that was developed (Neher & Plourde, 2012). Not only is there a set time which constrains the teacher due to implementation of a curriculum map, but the amount of material can be overwhelming for the teacher to cover in such a defined time span. The curriculum map should be a flexible paper document, not something set in stone and unyielding to the needs of the teacher. Curricula were developed with the hopes of meeting the needs of a diverse classroom with the ability for teachers to differentiate their instruction based on their students' previous exposure to the subject material and knowledge of the subject matter that they are studying (Neher & Plourde, 2012). Due to the curriculum maps teachers have felt conflicted about their own role in the education process. Teachers who strive to be student-centered, focusing on what they feel is best for their students, feel that the curriculum aligns against the teacher's own beliefs and that the curriculum takes precedence over the individual students' needs (Griffith, Massey, & Atkinson, 2013).

Both the curriculum map and the EOCs are set up by the state. Bringing the legislature into play and having the state government intertwined with the educational systems in place brings up further discussion, primarily that of funding. Curricula were adjusted to the standards and the standards were adjusted to fit the EOCs that were being implemented by states and lost in the middle of all of the interconnected ideas and ideologies were the students and actual instruction, which brought about the controversy of transformations in the American educational system, specifically that of the state of Florida (Neher & Plourde, 2012). Two teachers did recognize that there is a link connecting state funding and EOCs. "I do not think that this (abandoning EOCs)

will happen due to state funding. They keep changing the tests anyway. Very simply the job is to have the kids take the tests." "No, the district is too worried about state funding. This school is not a rich school. A high percentage of students fall in the poverty category." Two other teachers felt that the test assessed student knowledge and was used as a measure of student performance in the classroom. "I do not think that this would happen, but it should. The state tests are not an impressive way to test student knowledge. Way back the FCAT had much more emphasis on testing. It is for student appearances." "There is not a lot of support for testing, not so much as anti-testing sentiment, but we have to test. There is the pressure to teach to the test. Students' performance is linked to the test. Yes, it would not surprise me."

One final theme is the idea of accountability. There is the current debate that accountability pressures motivate teachers to focus their instructional planning on test content, primarily that of the EOC (Whitford & Jones, 2000). In this particular case of educational accountability, the accountability burden is placed in a greater part on the teachers. This ideology of having the teacher being held accountable is supported by a market-based paradigm.

The market-based paradigm of the Florida educational system simply states that the districts do not hold the students accountable, but instead, the teacher is held accountable (Hyden, 2011). This idea of accountability focuses on instrumentality. Focusing on instrumental accountability and not the knowledge of competency allows others, primarily the legislature and administrators, to find comfort in quantitative and numerical accountancy, something that can be definitively measured (Hyden, 2011). This leads the accountability process to be data driven. This idea of having data-driven accountability almost displays a cultish faith in quantitative analysis to support vague determinations of quality and limits what can be known from the results (Hyden, 2011). As with most types of accountability measures, there are some drawbacks. The idea of

learning has been defined by first choosing the measurement tools preferred or the kind of results

or data that count as knowledge, rather than by defining what learning is and then choosing the

best methods by which to assess it, which can lead to an inflexible, standardized model with its

own unique set of problems (Hyden, 2011).

It can truly be said that teachers, not programs, make the difference in student learning

(Towers, 2012).

Research question 2. What are the science teachers' perceptions about adaptations, if

any, to their instructional practices in areas such as pacing of instruction, assignments (artifacts

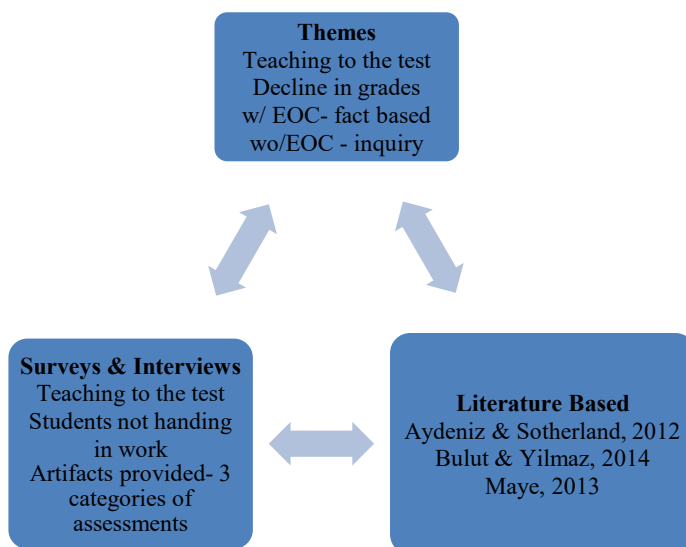such as quizzes, labs or other assignments), curriculum maps or other instituted practices?

Figure 3. Graphical triangulation between themes, responses from the survey and interviews and the literature for the second research question

Teaching to the test. This idea of teaching to the test has been mentioned due to the fact

that standardized test scores are used as a measure of their students' acquisition of the knowledge

and skills throughout the course of the entire year (Aydeniz & Sotherland, 2012). For the most

part, the teachers care about the students and want to see the students become successful in their

academic ventures. Due to this caring quality and nature of some teachers, teaching to the test

encourages them to devote more instructional time to preparing their students for test-taking

techniques to give their students their greatest potential for success on the EOC (Aydeniz &

Sotherland, 2012). It is ultimately the goal of the EOC to determine if the student has acquired

and retained enough knowledge of the subject. The assessments at best serve as proxies of the

knowledge and skills required in the workplace and real life, and the use of these assessments is

the sole measure on which to make high-stakes decisions, such as passing or failing a class, or

even being allowed to graduate (Aydeniz & Sotherland, 2012). This position that the teachers

have is due to intensive pressure of increasing test scores for the bulk of their students (Aydeniz

& Sotherland, 2012). This principle was also shown in the types of assessments that the teachers

used. As mentioned in the previous section of this paper, one of the major types of assignments

that teachers had as artifacts of their craft were various types of assessments. Strictly speaking,

Biology teachers, who have an expectation of an EOC, had a very limited type of assessment,

that of factual information. This idea of having only fact-based assessments will be discussed in

great detail later in this section, but it does warrant mentioning here, due to the fact that the EOC

contains fact-based questions. If a teacher wanted to prepare a student to take an EOC, what

better way would there be to prepare the student than by giving the student EOC like questions?

Again, this will be examined in greater detail later in this section. Teachers did not feel the need

to differentiate instruction due to the fact of the oncoming administration of the EOC (Aydeniz

& Sotherland, 2012).

Not all subjects have an EOC. Without this idea of "teaching to the test," teachers did

not feel a need to teach to one specific all-encompassing test, but to teach the academic standards

set forth by the county or to teach the material. With this idea in mind, Chemistry, Physics, and

other teachers whose courses do not have an EOC appear to have a wider range of instructional practices than the Biology teachers that have an administration of an EOC. Non-EOC teachers have the ability to differentiate instruction to address the learning needs of students and to cater instruction to the learning needs of their students, whether or not the students have motivation for learning science (Aydeniz & Sotherland, 2012).

Lower grades. Student achievement is a major concern in high schools. As mentioned in the previous section, currently teacher accountability has been linked to student achievement on the EOC. One potential reason students' grades are lower could be related to the fact a large number of students very simply do not hand in their work. This practice of not handing in one's work could have several underlying causes. One of these causes could be a student's perception of their mathematics ability. Some students tend to dislike mathematics, are apprehensive and even fear the subject, starting in elementary school, and become progressively more fearful of mathematics through each school year (Bulut & Uilmaz, 2014). Additionally, some students have a negative view of mathematics and develop self-doubt, which then leads to self-deprecation, and they start to believe they are not smart enough to learn mathematics and decide it is not a subject for them, turning off the entire idea of practicing math in a non-mathematics (e.g., Algebra 1) class. If students dislike math or are not comfortable with their math skill sets, their success in science classes might be limited (Bulut & Yilmaz, 2014).

Mathematics is not the only "problem" area in science classes; so too are English and Language Arts. Some students struggle with their writing skills when they are not enrolled in specific Language Arts or Writing classes and make little attempt to express themselves in writing in other subject fields (Ercan, 2014).

Due to its potential complexity, Chemistry also brings about students' apprehension to complete sometimes daunting assignments. A goal of Chemistry teachers is to present the effectiveness of general chemistry laboratory practices, current studies, knowledge and practices in order to change students' attitudes toward chemistry laboratories and their academic achievement (Ercan, 2014).

One final idea related to this phenomenon of lower grades is to take a look at the lower performing students in the class. Self-efficacy has also been found to be correlated with procrastination, which then leads the student to delay or avoid assignments they lack confidence to complete (Jani & Melinger, 2015). Some educators have mentioned that there are several factors affecting student achievement. To a degree, boredom—or, more to the point, redundancy—may also have produced a decline in students' overall intellectual curiosity, which impedes their ability to develop effective scholastic skill which in turn diminishes students' confidence about their ability to master all areas of their education, especially those skills that are not specifically taught by the teacher such as the mechanics of writing, time management, the application of critical thinking, and practice skills (Jani & Melinger, 2015). Self-efficacy has also been found to be correlated with procrastination.

With EOC – Fact-based. When teachers were asked to provide an artifact from their instructional practice, such as that of an assessment, Biology teachers provided fact-based assessments. As a part of the assessments the students either had to choose the correct response out of several choices, or to fill in the correct choice on some type of answer sheet, either made by the teacher or a Scantron© sheet. To reiterate: factual information tested or quizzed in a standardized way is that of "test items relying on simple memorization, while many other items require critical thinking, analysis, application, and other science process skills with a set series of

answers to choose from" (Drits-Esser & Black, 2014, p. 69). Having a fact-based assessment can provide meaningful feedback of student progress based on curriculum measures (Main, 2012).

One drawback of this type of assessment would be that even though, as mentioned previously, it would prepare the students for the types of questions that they would see and in some fashion expect to be on the EOC for biology, this type of assessment may undermine both a love of learning and the desire to acquire knowledge, which are necessary for intrinsic motivation (Ravitch, 2010). Having a fact-based assessment would build a student's study habits by reinforcing basic tasks of learning. Some of the basic tasks of learning that are reinforced through this method of assessment are: understanding information through activities that require listing, identifying, finding, naming, defining, reciting, recognizing, and applying content information within the discipline through rote, perfunctory tasks (Maye, 2013). Although the fact-based assessments were tightly structured, well-organized and true to the format of an EOC, the knowledge and cognitive domains primarily involved students in remembering and understanding information (Maye, 2013). The effort and energy teachers put into designing these cute, lower-level learning tasks were quite impressive but ultimately lost luster as the objectives lacked academic rigor. Factual information may be tested or quizzed in a standardized way. One way to define factual information tested or quizzed in a standardized way is that of "test items relying on simple memorization, while many other items require critical thinking, analysis, application, and other science process skills with a set series of answers to choose from" (Drits-Esser & Black, 2014, p. 69).

Without EOC – Inquiry. Students encountered three main difficulties in crafting scientific arguments: that of making claims that go beyond the evidence, not providing enough

supporting evidence, and focusing on evidence that supports their claims while ignoring evidence that does not, and were unwilling in some instances to complete the assignment (Lee, Cite, & Hanuscin, 2014). In this particular study one teacher had difficulties with an open-ended response. This may have been due to the fact that based on the literature, one common difficulty is that students today do not fully articulate their arguments and the evidence to support their claims but want to achieve the learning task beyond simply executing and not applying other cognitive processes (Lee, Cite, & Hanuscin, 2014). This problem is partly due to the importance school systems place on the EOC and the devaluation of critical thinking skills. The idea of traditional education that is in place at schools due to a wide battery of standardized tests has begun to deprive individuals of their freedom, passivizing them and killing creativity (Kumral, 2014). The learning environments are changing due to the standards-based learning movement, along with the attempts at restructuring, which becomes paramount based on high-stakes tests as well as state and national standards so that educators might be ready to ensure the crisis of thinking, feeling and doing does not become pervasive throughout education (Kumral, 2014; Earl, 2015). A definition of guided inquiry can be: "consisting of the ways in which the world is studied and explained based on the evidence of scientists in reference to an active learning process that engages students so that students will then start to understand the scientific ideas and procedures used in doing science" (Nivalainen, Asikainen, & Hirvonen, 2013, p. 452). Open-ended responses are typically used "to create a picture of student thinking relative to a topic or topics in order to assess both the range and the incidence of the ideas, which provides us with a wealth of information about what conceptions students may have constructed about a topic and to assess them in comparison with known facts" (Antonellis, Buxner, Impey, & Sugarman, 2012, p. 83).

The literature supports the effectiveness of student-centered instruction and assessment practices such as open-ended response and inquiry-based learning techniques, which are associated with greater student engagement and achievement than are traditional lecture-based, instructor-centered approaches (Lattuca, Bergom, & Knight, 2014).

Implication

The implication of this research falls under three parts: Practice, Theory, and Policy Adaptation. Each of these sections has its own points to discuss based on the results of the answers of the participants. The section based on practices is about how instructional practices are affected by an EOC. The next section, Theory, will describe why certain phenomena are occurring in the classroom. In the final section, Policy Adaptation, possible policy changes and suggestions will be offered by the researcher on steps for improvement and or remediation.

Implication on Practice. One important area of teaching is that of instructional practice. What the teacher does in the classroom and the importance of the teacher is often overlooked. This can be true of how teachers are affected by educational policies; one such example is that of administering an EOC. One recurring theme found in this research is that due to the importance and weight (both on the student and the teacher) teachers often find themselves between a rock and a hard place with the quandary of teaching to the test. The importance of the EOC, as has been mentioned throughout this paper, affects teachers and students, albeit differently, but still affects them. It is believed that administering an EOC leads to greater rigor in academic subjects and gives a means by which to measure teacher effectiveness, but often the opposite is true (Mueller & Colley, 2015). As seen in this research and previously mentioned in the literature, for teachers that administer an EOC the method of instruction has shifted from a student-centered learning environment to that of a teacher-centered learning environment. In order to possibly

correct this situation and to give more credence and relevance to inquiry learning and a more student-centered learning environment the structure, formatting and importance of the End of Course has to be adjusted. Some changes to policy that the researcher would suggest are mentioned later in this chapter.

The idea of re-introducing inquiry learning would then potentially change student perceptions on the educational process. With inquiry learning students are required to be more independent minded and potentially more creative in their problem solving abilities than just being given the information and told to memorize it for future use (Korte, Reitz, & Schmidt, 2016). Some of the issues that have arisen due to an attempt to bring inquiry learning to the forefront of the classroom is that often high school students often feel the need to just get through a class due to the educational requirements of the school and district and more to the point, students have a better (or different) perception of what is minimally required than some teachers or even administrators (Suldo, Frank, Chappel, Albers, & Bateman, 2014). All of the mentioned ideas then lead into the idea of the practice, specifically why teachers choose certain instructional practices.

In addition for school leaders, other items need to be taken into account. The other aspects that leaders need to implement would be strategic--share strategies between teachers that administer EOCs. It would also benefit the morale of teachers if there was a more effective balance of performance reviews, based not only on the final outcomes of EOCs but other aspects of teaching. Administration may also find the need to mediate teacher anxiety caused by the stresses of an EOC. Finally, there is a need to move beyond basic instruction to more guided inquiry.

Implication for Theory. This research takes place in order to study the phenomenon of teachers' perceptions of an EOC, and in more detail, determine how teachers' practices are affected due the final administering of an EOC. In reviewing the data there is one overriding theory that the data points to, along with a secondary theory.

The main overriding theory is that of even though the EOC was instituted to improve student performance, in practice it has the opposite effect of negatively affecting student performance. This theory is elaborated on in the previous chapter of this paper. This can be demonstrated by the types of assignments, mainly focusing on lower cognitive learning abilities such as memory recall of factual information, but still having the students achieving lower grades and a worsening performance on standardized tests. One possible reason behind this is that the students are receiving so much specific information in a relatively short time span that they are unable to comprehend or process the information.

The theory of the magnification of the results of the EOC is also demonstrated. Due to the singular nature of the EOC, the results of this particular test, primarily the effects it has on teachers that administer it, are magnified beyond its constructed purpose. The unintended consequences are that teachers have the perception that the EOC has led them to teach to the test due to time constraints while following a strict curriculum map that has forced them to change their teaching strategies from inquiry learning to direct inquiry and even though the cognitive load placed on the students is lessened, the results are in contrast to those expected, producing poorer performing students.

One poignant comment from the interviews about covering the educational standards in conjunction with the EOC was: "I make sure I complete at least what is required of me to ensure my position as a teacher." This was one unique comment by the participants that does not seem

to be echoed by other participants. It is important to note that this comment came from a new teacher who was hired after the beginning of the school year. This minimalist approach as a teacher, although not ideal, has also been reflected in the literature. In some instances workers or in this specific case teachers, perform to a level that meets the basic requirements of the position that they hold, with little deviation toward putting forth any additional effort, but accomplishing the tasks set before them as a requirement of the position (Lorange, 2006).

This idea of minimalism is also highlighted in the recurring theme of teaching to the test. With the idea of teaching to the test, the classroom teacher prepares the students for the test, and only the test, often leaving out more detailed information unless that information is required knowledge (Welsh, Eastwood, & D'Agostino, 2014). Teaching to the test also permeates education due to link test scores with teacher accountability. Teacher accountability, in part, is measured by EOCs; in addition a Merit Pay, or Performance Pay based wage links student achievement in part to teacher wages (Woessmann, 2011). In this scenario it is not difficult to see the economic advantage of teaching to the test. If students are taught to the test and perform better on standardized tests than students from an inquiry learning background or other teaching style background, then their teachers may be eligible for performance or merit pay. Other situations can lead to this by changing certain variables as well and it is important to note that merit pay can have different factors associated with it. This minimalistic approach also follows the theme of having time constraints in place themselves as evident in the results section of this research.

Implication on Policy Making and Formation. In light of the current mood of the educational system in the State of Florida, many educational policies are made that affect the teachers and their working environment. One of the major policies that affects teachers is the

administration of an EOC. The current policy is that only Biology teachers administer an EOC. The EOC is also administered in other core subjects, but this particular research focuses on the perception of science teachers who either administer or do not administer an EOC. Based on the results and the information given by teachers, several changes should potentially be made to the administering of the EOCs.

As mentioned previously, the EOCs make up a part of the student's overall grade and are a part of the teacher's evaluation process. Due to the fact that only Biology teachers are required by state mandate to administer an EOC, which is tied to the Biology teacher's evaluation as a part of teacher accountability, Biology teachers have an unfair burden placed upon them versus their colleagues within their own department such as Chemistry, Physics, and other non-EOC science teachers. For this particular issue there could be two different possible scenarios to even out the evaluation process and to even out accountability issues. One possible scenario deals with policy implementation. In order to make evaluations a level playing field, EOCs should not count for or against a Biology teacher's evaluation process. This proposal stems from the data received from the teachers that EOCs are one of the reasons that student grades have declined: "Grades have overall declined since the EOC was implemented." Lower achievement of one's students would lead to a lower evaluation of a teacher and may lead to accountability issues and possible employment issues.

The second scenario would be slightly more controversial but it would still make all teachers equal in the eyes of the county and the state. This scenario would mandate that all science classes would administer an EOC. If all science subjects were required to have an EOC, not only Biology teachers would feel the stress of having their students perform well on the EOC. Then those teachers that currently teach non-EOC courses such as Chemistry, Physics and

other sciences would have to deal with the stress and pressures of student success tied to the

EOC scores, too. This would level the arena where all teachers would have to deal with the same

issues, not just a segregated section of science teachers. Both possible scenarios would lead to

an equal evaluation process and it would no longer separate instructional practices between

subjects but would lead to equity within the science departments of the county and state science

departments. These possible policy changes have positive and negative aspects associated with

them. Besides treating teachers as equals, which is the same in both cases, the positive aspect of

not having an EOC in Biology would be that teachers may gain more instruction time. The

negative aspect of removing the EOC from Biology would be that there would be no standard

measure of student gains in Biology and teachers would only be evaluated on student

performance during the school year, with no end of year guide or criteria to go by. The positive

aspect of mandating that all science classes (biology, chemistry, physics, environmental science,

etc.) have an EOC would be that all teachers would be evaluated on an equal basis. All teachers

would have an EOC as a basis of evaluation and this would not vary from class to class. The

negative aspect to this proposed idea would be that the other science teachers would have to

adapt their instructional practices in order to accommodate an EOC into their curriculum map.

This proposal could lead to the teachers' use of fewer time-consuming, inquiry-based

instructional practices and their reliance on fact-based learning because of time constraints.

Having a major change to this extent may have to be ratified through other teaching agencies as

well, such as teacher unions, and may not be the most popular idea to be proposed to the county.

     As most recently reported in the news, in some Florida school counties, due to a shift in

standards in subjects other than sciences, specifically for Algebra classes, the EOC for Algebra is

not counted against the students' grade, nor is it counted as a part of the teachers' evaluation

(News 13, May 2015). One possible policy change is that an EOC for Biology, or even other classes, could still be administered if the county were inclined to go in a particular direction as far as standardization of the educational system, but not count against the students' grade or ability to graduate and not count toward a teacher's evaluation.   With this possible change in policy, neither the student nor the teacher would feel undue pressure regarding test performance. The teacher would not teach to the EOC and yet the test results could be used as a benchmark scoring to evaluate student gains in the classroom without the added pressure of it being a high-stakes exam.

One way to alleviate the inequity due to the fact that only biology teachers are held accountable by the EOC is that there would need to be a change in performance reviews in order to take into account the addition or lack of the EOC.

Limitations

This study had some limitations. The limitations were set both by the researcher and some aspects of this study. One limitation was due to the fact that several principals were contacted for permission to enter their schools but only three of a possible ten schools allowed the research to take place in their respective buildings. The schools that were visited had little or no demographic diversity. This study was limited by the researcher in that this is a non-random sample research, but specifically, as mentioned in the methodology section of this paper, that this research was purposive and only studied one academic department. Another limitation the researcher made was to focus on one specific school district and not to take into account other school districts in the state of Florida. One limitation pressed on the researcher was that of the timing of this research. Due to county regulations there were only certain times available for this study to take place. This also led to a limitation in participants chosen to conduct interviews

with, primarily with that of teachers who were available and had time to sit down during their planning period.

Another limitation that the researcher could not control was the demographic population that volunteered from this project. The majority of the teachers were Caucasian, middle-aged women. As the data also indicated, the demographic age range of the teachers was slightly skewed toward the older age brackets. Looking at this demographic data might lead one to examine the county's recruitment and retention of new teachers. It appears from the demographics that this particular county has a high retention rate, but the schools are not hiring more teachers. This seems to be contrary to a 2004 study by Watlington, Shockley, and Earley which indicated that older new hires were less likely to be retained than younger new hires. This fact might lead to new questions and may lead to a purely demographic study of this particular county. This study of retaining older, more experienced teachers may lead to questioning the lack of younger teachers in the employment of the district by determining the process through which teachers, especially younger teachers, are recruited, hired and retained throughout their career (Watlington, Shockley, & Earley, 2004). It would seem that younger teachers would be more current in some of the newer teaching methods, standards, and requirements of the county, but the younger generation of teachers, at least in these three schools, made up less than one third of the surveyed population. For future research it would also be of use to investigate whether or not other academic fields reflect the same general demographic trend. It has been reported that school districts are under pressure by stakeholders of the school district and the legislature to hire highly qualified teachers. In response to this idea, schools have attempted to address this 'teacher shortage' through teacher recruitment, teacher education reform, certification rule changes, and professional development for teachers (Darling-Hammond, 1999). Some answers

to the skewed nature of the demographics of the three schools could also be determined from a different perspective. In the future, a researcher could look at the overall demographics of the schools and school district in an attempt to discern which schools are potentially hiring younger teachers who are familiar with the current aspects of the teaching profession versus more experienced teachers that have gone through two or more policy and practice changes, and how the younger teachers who leave are prepared and retained in their schools (Watlington, Shockley, & Earley, 2004).

A final limitation was that of school selection. Selecting schools that are B/C schools may produce results different from lower graded schools (D/F) and higher graded schools (A).

Future Research

This particular study focused on a relatively small population of one specialized subject area in one type of school. Several possible avenues exist to conduct further research on EOCs and the perceptions of teachers who administer them.

In order to further validate these particular findings it would be interesting to note if these findings would be similar in regard to other high schools, districts, geographical area, and states. It would also be it would be of possible interest to examine the demographic area of teacher experience, to determine if new or less experienced teachers have similar or different viewpoints to this studies particular teacher population.

This study looked specifically at high schools. High schools make up a relatively small grouping of schools within any school district. Another idea for future research would be to perform a similar study investigating the perceptions of grade school or middle school science teachers. This new study might provide insight on whether or not science teachers at the

elementary or middle school levels felt the same pressures as their high school science teacher counterparts.

One final, teacher-specific area of future research would be to revisit the specific high schools that participated in this study. Knowing the data already gathered from the school's science department, a similar research study could be conducted to investigate the perceptions of teachers from other academic departments to see if their feelings and perceptions are similar to or different from those expressed by their colleagues in the science department. This study would be important to see if this phenomenon is unique to biology teachers and science departments, or if the perceptions are shared with other departments throughout the school.

The final aspect of future research would be to look at school leadership. This would be a unique study to look specifically at the perceptions of principals, vice principals, and assistant principals on the matter of EOCs. This study might provide the administrators' perception of how schools and departments have changed their focus in instructional practices over time due to the administering of EOCs. It might also provide insight on how EOCs are conducted in a school and district where there are both subjects with an EOC and academic subjects without EOCs, and provide insight regarding the execution and bureaucracy of handling and administering the EOC.

Conclusion

Teachers have an extremely difficult job with a variety of pressures. The teaching profession is unique in that teachers are heralded as the most important part of the school system, yet have very little say in the policies that affect them directly. This research attempted to document the lived experiences of the teachers from one of many possible angles. Teachers that are charged by the county and the state to administer an EOC, an exam that has wide-ranging

implications for both the teachers and the students that they are instructing, have a unique perception of the Florida education system in comparison with their peers who do not have to administer an EOC.

This research examined several items and compiled data about the perceptions of high school science teachers. One important facet of this study was to discern the demographic information of the teachers, the students, and the classroom setting. This study also answered the question: What are the science teachers' perceptions about how the presence or absence of an EOC affects their instructional classroom practices? This was accomplished by gathering data from both surveys and follow-up interviews. This study revealed the teachers' need to cope with the pressure of time constraints on their instruction and working within the curriculum map as mandated by the county offices. The study also revealed their concerns about how teacher accountability is linked to their students' performance on the EOC.

The second question was: What are the science teachers' perceptions about adaptations to their instructional practices, if any, in areas such as pacing of instruction, assignments (artifacts such as quizzes, labs or other assignments), curriculum maps or other instituted practices? This question was answered through surveys, follow-up interviews, and the collection of artifacts from the teachers. The results yielded several facts, including that teachers are pressured to increase student gains and therefore teach to the test, that due to the administering of an EOC, student grades in biology class have declined, and finally that due to having an EOC, assessments given by teachers varied in that teachers who administered EOCs tended to give more fact-based questions, and non-EOC teachers included more open, inquiry-based assessments.

Finally, this research provided the reader insight into the perception of teachers, through the teachers' lived experiences in a mid-sized, central Florida school district. This research provided evidence that may lead to policy changes and give teachers a voice in the creation of policy that will affect them as well as their students. This study brought the plight of the teacher to the forefront and gave meaning to the phenomenon of why teachers are the most important piece of the educational system.

Appendix A

Questionnaire

Teacher and Student Demographic Data
Teacher:
1. Gender   Male   Female
2. Age Range   22-27 28-33 34-39 40-45 46-51 52+
3. Ethnicity   Caucasian   African American   Hispanic   Asian   Other
Level of education
1.   Degree(s) Held   BA   BE   BS   MA   ME   MS   PhD   EdD
          Other _____
Length of teaching
1. Years at current school   1-3   4-10   11-20 20+
2. Years teaching (Total)   1-5   6-10   11-16 17-22 23-30 30+
Science subject taught.
1. What class(es) do you teach?   _____
2. What levels do you teach?   General   Honors   AP
Students:
1. On average how many students are assigned to your class? _____
2. What is the approximate ethnicity of your students (%)?
      _____ Caucasian   _____ African American _____ Asian
      _____ Hispanic   _____ Other

Research Question 1: What are the perceptions of science teachers about how the presence or absence of an EOC affect their instructional classroom practices?

1. How do you fulfill teaching the required standards and material knowing that there is an EOC, and if you do not have an EOC how do you fulfill teaching the required standards and material?

2. How do you break up the allocated time for instruction?

3. Approximately, what is the percent grade distribution in your class(es)
       _____ A   _____ B   _____ C   _____ D   _____ F
and can you describe anything that would affect the grade distribution?

4. How is teacher accountability affected by student achievement and what role would the EOC have, and if you don't have an EOC what then affects teacher accountability?

Research Question 2: What are the perceptions of science teachers about adaptations to their instructional practices if any in areas such as pacing of instruction, curriculum maps or other instituted practices?

5. What are the driving forces of your instruction in your class? Is it the EOC, subject or standards and why?

6. Have you had any challenges to your instructional practice due to any instituted practices?

7. When comparing times before and after EOCs, how have your students been affected by your instructional practice(s)?

8. What role would you say that leadership has with the EOC or any other aspect of your instructional practice?

Interviews

1. Could you tell me a little more about how your county would react if like in two other County Schools, the county refused to take part in any state mandated test. Do you feel that this would happen in this County as well? Why or why not?

2. Why do you think of the idea that EOCs in Florida are fast paced, and some might say Florida may need to remake the required standardized tests: As a science teacher, what is your feeling on this? What do you think your students feel about this?

3. One of your colleagues mentioned educational standards in conjunction with EOCs, could you elaborate more on that?

4. Do you have a copy of some types of assessments or lesson plans? Could you explain them to me and if possible could I have a copy to read for myself?

5. Have your teaching practices changed due to the fact that you either administer or do not administer an EOC?

6. Has either administering or not administering an EOC affected the assignments that you give your students?

7. In your own words, what roles would you say your current position encompasses as to either a leadership role, or your role in the classroom?

8. Is there anything else that you would like to mention based on the questions that I have been asking you?

Appendix B

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI)
ANIMAL TECHNICIANS CURRICULUM COMPLETION REPORT
Printed on 02/26/2014
LEARNER
Thomas Keller (ID: 1410102)

USA
DEPARTMENT Education
PHONE
EMAIL
INSTITUTION University of North Florida
EXPIRATION DATE 01/21/2017
ANIMAL TECHNICIANS
COURSE/STAGE: Basic Course/1
PASSED ON: 01/22/2014
REFERENCE ID: 12085759
REQUIRED MODULES DATE COMPLETED
Introduction to Working with the IACUC 01/22/14
Working with the IACUC 01/22/14
Federal Mandates 01/22/14
The Veterinary Consultation 01/22/14
Getting Started 01/22/14
Alternatives 01/22/14
Avoiding Unnecessary Duplication 01/22/14
USDA Pain/Distress Categories 01/22/14
Endpoint Criteria 01/22/14
Personnel Training and Experience 01/22/14
Occupational Health and Safety 01/22/14
Euthanasia 01/22/14
Making Changes after You Receive Approval 01/22/14
Reporting Misuse, Mistreatment, or Non-Compliance 01/22/14
Final Comments 01/22/14
Introduction to Post-Procedure Care of Mice and Rats in Research: Minimizing Pain and Distress 01/22/14
Investigator Responsibility 01/22/14
Minimizing Sources of Nonexperimental Variation 01/22/14
Systematically Monitoring for Pain and Distress 01/22/14
Detecting Clinical Signs of Pain and Distress 01/22/14
Appearance and Behavior 01/22/14
Physical Exam for Clinical Condition 01/22/14
Body Weight 01/22/14
Fluid and Electrolyte Balance 01/22/14
Body Temperature 01/22/14
Tumors 01/22/14
Alleviation of Pain and Distress 01/22/14
Documentation of Post-Procedure Care 01/22/14
Summary 01/22/14
For this Completion Report to be valid, the learner listed above must be affiliated with a CITI Program participating institution or be a paid
Independent Learner. Falsified information and unauthorized use of the CITI Program course site is unethical, and may be considered
research misconduct by your institution.
Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
                    CITI Program Course Coordinator

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI)
BASIC/REFRESHER COURSE - HUMAN SUBJECTS RESEARCH CURRICULUM COMPLETION REPORT
Printed on 02/26/2014
LEARNER
Thomas Keller (ID: 1410102)

USA
DEPARTMENT Education
PHONE
EMAIL
INSTITUTION University of North Florida
EXPIRATION DATE 01/16/2017
GROUP 2 SOCIAL BEHAVIORAL RESEARCHER INVESTIGATORS AND KEY PERSONNEL
COURSE/STAGE: Basic Course/1
PASSED ON: 01/17/2014
REFERENCE ID: 12085758
REQUIRED MODULES DATE COMPLETED
International Studies 01/17/14
Students in Research 01/17/14
Introduction 10/12/09
History and Ethical Principles - SBE 01/17/14
Defining Research with Human Subjects - SBE 01/17/14
The Regulations - SBE 01/17/14
Assessing Risk - SBE 01/17/14
Informed Consent - SBE 01/17/14
Privacy and Confidentiality - SBE 01/17/14
Research with Prisoners - SBE 01/17/14
Research with Children - SBE 01/17/14
Research in Public Elementary and Secondary Schools - SBE 01/17/14
International Research - SBE 01/17/14
Internet Research - SBE 01/17/14
Research and HIPAA Privacy Protections 01/17/14
Vulnerable Subjects - Research Involving Workers/Employees 01/17/14
Hot Topics 01/17/14
Conflicts of Interest in Research Involving Human Subjects 01/17/14
University of North Florida 10/12/09
For this Completion Report to be valid, the learner listed above must be affiliated with a CITI Program participating institution or be a paid
Independent Learner. Falsified information and unauthorized use of the CITI Program course site is unethical, and may be considered
research misconduct by your institution.
Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Program Course Coordinator

Appendix C

Consent Form

SELECTED HIGH SCHOOL SCIENCE TEACHERS' PERCEPTIONS   REGARDING
ADAPTATIONS TO THEIR INSTRUCTIONAL PRACTICES DUE TO THE
IMPLEMENTATION OF EOCS IN A MID SIZED CENTRAL FLORIDA SCHOOL DISTRICT

Researchers: **Thomas V. Keller**

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study

Science education is a unique field that blends several different academic disciplines. Just as in other areas of education, the teacher is at the forefront in the classroom. This study would take into account the teachers' perspectives on the EOCs and how EOCs have affected their instructional practices in comparison to teachers who do not administer an EOC. The purpose of this research is to examine the perceptions of science teachers regarding EOCs in public schools in central Florida. The importance of this research is to give the teachers a voice to express the difficulties encountered in the classroom as they attempt to adhere to the prescribed standards and procedures. The importance of EOCs can lead to frustrations from areas outside of the classroom. The focal question that this piece of research is to examine is selected high school Biology teachers' perceptions about how their instructional practices have been affected by the implementation of an EOC in comparison to other high school science teachers who are not required to administer an EOC. The interviews will be based on teachers' perceptions of the EOCs and how their instructional practice has been affected. This research is important due to EOCs and the aspect of teacher accountability.

If you agree to participate, you will be asked to fill out a brief questionnaire and answer some questions about the science standards and your approach to them. Your participation in the study will last approximately 20 minutes on two separate days.

Benefits
There are some potential benefits to this research. This research would

1: Act as a voice of the teachers

2: Provide information to the legislature based on teacher feedback

3: Add to the current body of knowledge on the subject

<div align="center">Confidentiality and Records</div>

Your study information will be kept anonymous without any identifiers. Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:

* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;

* Representatives of University of North Florida (UNF), including the Institutional Review Board, a committee that oversees the research UNF in the Office of Research and Sponsored Programs

Contact Information

If you have any questions regarding this study, please contact **Thomas V. Keller**
<div align="center">**or Dr. Francis Godwyll**</div>

If you have any questions regarding your rights as a research participant, please contact, Institutional Review Board University of North Florida,

By signing below, you are agreeing that:

- you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
- you have been informed of the reasons for this research and they have been explained to your satisfaction.
- you are 18 years of age or older
- your participation in this research is completely voluntary
- you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Signature_____   Date_____

Printed Name_____

Date_____

Appendix D

MEMORANDUM
DATE: October 7, 2014
TO: Mr. Thomas Keller
VIA: Dr. Francis Godwyll
Leadership, School Counseling & Sport Management
FROM: Dr. Jennifer Wesely, Chairperson
On behalf of the UNF Institutional Review Board
RE: Declaration of Exempt Status for IRB#644593-2:
"Perspectives of Science Teachers Regarding Adaptations to Their Teaching Styles due to Science Standards in Florida. A Study of Two Selected Schools in a Mid-Sized Florida School District"
Your project, "Perspectives of Science Teachers Regarding Adaptations to Their Teaching Styles due to Science Standards in Florida. A Study of Two Selected Schools in a Mid-Sized Florida School District" was reviewed on behalf of the UNF Institutional Review Board and declared "Exempt" category 2. Based on the recently revised Standard Operating Procedures regarding exempt projects, the UNF IRB no longer reviews and approves exempt research according to the 45 CFR 46 regulations. Projects declared exempt review are only reviewed to the extent necessary to confirm exempt status.

Please ensure that completed surveys, interview notes, and signed consent forms are stored separately. The goal is to minimize the chance of a breach of confidentiality should documents be viewed by someone not formally associated with this study. For more information about data protections, please refer to our UNF IRB Guidance on Secure Data Storage.

Once data collection under the exempt status begins, the researchers agree to abide by these requirements:

☐ All investigators and co-investigators, or those who obtain informed consent, collect data, or have access to identifiable data are trained in the ethical principles and federal, state, and institutional policies governing human subjects research (please see the FAQs on UNF IRB CITI Training for more information).

☐ An informed consent process will be used, when necessary, to ensure that participants voluntarily consent to participate in the research and are provided with pertinent information such as identification

of the activity as research; a description of the procedures, right to withdraw at any time, risks, and benefits; and contact information for the PI and IRB chair.

☐ Human subjects will be selected equitably so that the risks and benefits of research are justly distributed.

☐ The IRB will be informed as soon as practicable but no later than 3 business days from receipt of any complaints from participants regarding risks and benefits of the research.

☐ The IRB will be informed as soon as practicable but no later than 3 business days from receipt of the complaint of any information and unexpected or adverse events that would increase the risk to the participants and cause the level of review to change. Please use the Event Report Form to submit information about such events.

☐ The confidentiality and privacy of the participants and the research data will be maintained appropriately.

While the exempt status is effective for the life of the study, if it is modified, all substantive changes must be submitted to the IRB for prospective review. In some circumstances, changes to the protocol may disqualify the project from exempt status. Revisions in procedures that would change the review level from exempt to expedited or full board review include, but are not limited to, the following:
☐ New knowledge that increases the risk level;

☐ Use of methods that do not meet the exempt criteria;

☐ Surveying or interview children or participating in the activities being observed;

☐ Change in the way identifiers are recorded so that participants can be identified;

☐ Addition of an instrument, survey questions, or other change in instrumentation that could pose more than minimal risk;

☐ Addition of prisoners as research participants;

☐ Addition of other vulnerable populations;

☐ Under certain circumstances, addition of a funding source

Investigators who plan to make any of the above changes should contact the IRB staff so that the review level can be changed as necessary. If investigators are unsure of whether a revision needs to be submitted, they should contact the IRB staff for clarification.
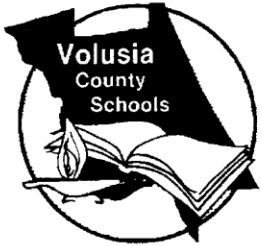**Your study was declared exempt effective 10/07/2014**. Please submit an Exempt Status Report by 10/07/2017 if this project is still active at the end of three years. However, if the project is complete and you would like to close the project, please submit a Closing Report Form. This will remove the project from the group of projects subject to an audit. An investigator must close a project when the research no longer meets the definition of human subject research (e.g., the data are de-identified and the researcher does not have the ability to match data to participants) or data collection and analysis are complete. If the IRB has not received correspondence at the three-year anniversary, you will be reminded to submit an Exempt Status Report. If no Exempt Status Report is received from the Principal Investigator within 90 days of the status report due date listed above, then the IRB will close the research file. The closing report or exempt status report will need to be submitted as a new package in IRBNet.
All principal investigators, co-investigators, those who obtain informed consent, collect data, or have access to identifiable data must be CITI certified in the protection of human subjects. As you may

know, **CITI Course Completion Reports are valid for 3 years**. Your completion report is valid through 01/16/2017 and Dr. Godwyll's completion report is valid through 04/10/2015. The CITI training for renewal will become available 90 days before your CITI training expires. Please renew your CITI training within that time period by following this link: http://www.citiprogram.org/. Should you have questions regarding your project or any other IRB issues, please contact the research integrity unit of the Office of Research and Sponsored Programs by emailing IRB@unf.edu or calling (904) 620-2455.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within UNF's records. All records shall be accessible for inspection and copying by authorized representatives of the department or agency at reasonable times and in a reasonable manner. A copy of this memo may also be sent to the dean and/or chair of your department.

Appendix E

P.O. Box 2118 • 200 North Clara Avenue • DeLand, Florida   32721-2118

DeLand	Daytona Beach	New Smyrna Beach	Osteen
(386) 734-7190	(386) 255-6475	(386) 427-5223	(386) 860-3322

School Board of Volusia County

Ms. Candace Lankford, Chairman
Mr. Stan Schmidt, Vice-Chairman
Mrs. Diane Smith
Mrs. Linda Costello
Mrs. Ida D. Wright

Dr. Margaret A. Smith
Superintendent of Schools

September 29, 2014

Mr. Thomas V. Keller

Mr. Keller,

I have received your additional request to conduct research at New Smyrna Beach, University and Pine Ridge High Schools and approve your topic "Perspectives of Science Teachers Regarding Adaptations to their Teaching Styles due to Changing Science Standards in Florida. A study of three selected schools, in a mid-sized Florida school district."

As with all request to do research; participation is at the sole discretion of the principal and teachers involved.

By copy of this letter, you may contact the two additional principals to verify that they will allow this research to be conducted at their school sites.

I would appreciate receiving a copy of your finding upon completion of the student.

Sincerely,

Signature Deleted

Alicia Parker, Ed.D.
Assistant Director, Program Accountability & Evaluation

AKP/mc

An Equal Opportunity Employer

Appendix F

The Bare Essentials of Polarity
Graphic redacted, paper copy available upon request to home institution.

S.L.A.M.
Graphic redacted, paper copy available upon request to home institution.

Worm, B 2006
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Graphing the Atmosphere

Graphic redacted, paper copy available upon request to home institution.

Review 2

Graphic redacted, paper copy available upon request to home institution.

Naming Ionic Compounds

Graphic redacted, paper copy available upon request to home institution.

Ionic Bonding

Oh Deer
Graphic redacted, paper copy available upon request to home institution.

EOC Review
Graphic redacted, paper copy available upon request to home institution.

Section Quiz: Tides
Graphic redacted, paper copy available upon request to home institution.

Cell Organelles: Quiz 2
Graphic redacted, paper copy available upon request to home institution.

Oceans

167

168

Environmental Science Exam

Graphic redacted, paper copy available upon request to home institution.

Population Ecology Exam

Graphic redacted, paper copy available upon request to home institution.

Appendix G

Analytic Memo Excerpt

Interview: School 1

Based on the interviews conducted there is a sense of frustration that the two biology teachers voiced in comparison to the chemistry teacher, who did not share the same concerns. The two biology teachers appeared to have more emotional connection and a shared exasperation on the district testing policies, as did the students. The chemistry teacher, in comparison, did not exude the same feelings. There is also the feeling of dissension within the department between different science subject teachers due to the regulation of an additional required exam and the preparation that went along with preparing the students for the EOC.

I feel from my experience as a former teacher that the EOC is an additional source of stress for teachers as well as increasing the workload on Biology teachers, where as chemistry teachers do not have the additional stress. There is also the perceived discrepancy in both work and compensation between the different members of the same department. The term accountability that has been tossed around in various news pieces aired through the local TV and radio stations. From conducting the interviews the idea of accountability comes into play. In listening to the teachers, there appears to be different accountability criteria for teachers of similar experience on the same pay scale structure.

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Zinth, J. D. (2012). End-of-course exams. *Education Commission of the States (NJ3)*.

Vita

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Teaching Positions
- 2016 <u>Adjunct Professor.</u> **Stetson University,** DeLand, Fl: Environmental Science and Studies
- 2013 – 2015. <u>Adjunct Professor.</u> **Bethune Cookman University**, Daytona Beach, Fl: Natural Science Department
- 2012 -2013. <u>Teacher of Record (Part Time).</u> **Deltona High School**, Deltona, Fl: Earth Space Science
- 2011. <u>Adjunct Professor.</u> **Columbia College**, Jacksonville, Fl
- 2010. <u>Adjunct Professor.</u> **Jacksonville University**, Jacksonville, Fl Biology Department
- 2008. <u>Teacher of Record.</u> **Ed White H.S.**, Jacksonville, Fl: Anatomy & Physiology and Zoology
- 2005. <u>Teaching Assistant.</u> **Western Michigan University,** Kalamazoo, MI: Molecular & Cellular Biology Laboratory
- 2000. <u>Teacher of Record.</u> **Saint Phillip the Apostle School,** Brigantine, NJ: Science section: Upper Grade (6-8) Computer/ Information Technology: School (K-8)

Research Positions
- <u>Student Research Assistant</u>- **Western Michigan University** Kalamazoo, MI Spring and Summer 2006
  - Dr. Charles Ide: Environmental Studies
  - Dr. Christine Byrd: Neurobiology
- <u>Assistant Research Scientist</u>, **NYS IBR/OMRDD** New York City, NY. 2003 - 2005
  - Developmental Biochemistry, Neural Cell Signaling Lab; Dr. Michael R. Quinn, laboratory head
- <u>Research Assistant.</u> **Georgian Court University**, Lakewood, NJ. 2003 -2004
  - Department of Biology and Chemistry; Dr. Neena Philips, Assistant Professor

Education
- Current Enrollment – <u>Doctorate of Education in Educational Leadership, Science Education</u>
  - **University of North Florida**, Jacksonville, Fl
  Dissertation: Selected High School Science Teachers' Perceptions Regarding Adaptations to Their Instructional Practices Due to the Implementation of EOCs in a Mid-Sized Central Florida School District
- August 2002 <u>- Master of Science, Biology</u>
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- May 1999 <u>Bachelor of Arts. Environmental Science</u>
  - **Saint Anselm College**, Manchester, NH
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- *Member,* Pi Lambda Theta: International Honor Society and Professional Association in Education; Chapter-University of North Florida; Region-Southeast Region (VIII)

Publications

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