A PHENOMENOLOGICAL STUDY OF PUBLIC SCHOOL BIOLOGY TEACHERS WHO BELIEVE IN THE LITERAL GENESIS ACCOUNT OF CREATION

by

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Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this phenomenological study was to understand the experiences of Christian public high school biology teachers who believe in a literal, young earth account of creation as revealed in the book of Genesis. There is a gap in the literature regarding understanding the teaching experiences of Christians who believe in a strict interpretation of the biblical book of Genesis. This study was conducted by interviewing 11 Christian public school biology teachers from multiple states who met the criteria for being identified as young earth creationists. Data were also collected through a focus group and reflective vignettes. Data were analyzed through coding techniques, such as creating a classification scheme based on verbatim interviews, in order to identify emerging themes and categories of common experiences. The themes that emerged were: a love for science, a strong religious belief, the willingness to teach what evolution is, the intent to discount evolution, tension from outside sources, the feeling of strong community support, the belief of strong student relationships, and only a vague understanding of the current legal status of the creation/evolution debate. An understanding of the shared phenomenon of these teachers allows for a more complete understanding of the makeup of American biology educators.

Keywords: creation, evolution, biology, creationism, theistic evolution, Genesis

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List of Abbreviations

Institute for Creation Research (ICR)

Intelligent Design (ID)

Science Teaching Efficacy Belief Instrument (STEBI)

CHAPTER ONE: INTRODUCTION

Overview

Teachers of varying backgrounds and belief systems instruct America's high school students in the discipline of biology. Christians who believe God created the universe in six literal 24 hour days as recorded in the biblical book of Genesis are a subset of teachers who were the participants in this study. This phenomenological study sought to understand the experiences of Genesis-believing, Christian teachers and the internal and external struggles they may have faced throughout their employment. The intersection of the religious and scientific beliefs of these teachers was examined in their historical and social contexts.

Background

The conflict over the beginning of the universe and the origins of life has been occurring with fervent debate for the past century (Harrub, 2010). Ever since Charles Darwin (1859), and those with similar thinking such as Jean Lamarack, suggested that species originate from other species through natural selection, Christian fundamentalists have met the challenge of defending their faith with a religious zeal. Fundamentalist Christians believe God created the universe and all life in six, 24-hour days within the past 10,000 years. Any other suggestion is perceived as an attack on their faith (Thompson, 2002). Pressure on Christian teachers to put aside the Genesis narrative and teach an alternative theory is perceived as the equivalent of forcing them to denounce their faith and endanger their soul (Miller, 2012).

Charles Darwin (1998) theorized that a process he termed "natural selection" was responsible for primitive forms of life evolving into more complex organisms. His famous journey throughout the world, especially among the Galápagos Islands, is usually what comes to mind when one inquires about the history of evolutionary thought. Darwin's finches have

become the textbook case for how natural selection causes inner-species change (Skinner et al., 2014).

Darwin's beliefs caught on quickly throughout the scientific community. For example, Ernst Haeckel, Ludwig Rutimeyer, and Thomas Huxley all became well known for their support of Darwin's ideas (Harrub, 2010). What began as a biological model eventually spread to the fields of geology, astronomy, and the social sciences. Geologists adjusted their young earth model to place the earth at millions of years old and solidified the concept of uniformitarianism, the belief that steady, long-term changes have shaped the earth (Harrub, 2010). Astronomers extended the timeline further to include billions of years and suggested a point of origin for all matter and energy within the universe (May, Thompson, & Harrub, 2003).

Within the Christian churches there was controversy as Darwin's theory began to take root in the early part of the 20th century. Some viewed science as anti-religion. Others modified their understanding of the biblical narrative to one of figurative language. Some cited faulty reasoning and poor science to the old earth Darwinian model and held to the belief that science could best be explained by a Creator outside of the natural world (Harrub, 2010).

At the beginning of the 20th century, nearly all individuals, including teachers, clung to the traditional conservative view, but there were some who challenged both state law and local values (Berkman & Plutzer, 2010). For example, in 1925, Tennessee businessmen persuaded John Scopes, a Dayton, Tennessee school teacher to acknowledge he was using an evolutionary textbook which was in violation of Tennessee law. A dramatic case followed in what would later come to be known as the Scopes Monkey Trial. Tennessee, represented by William Jennings Bryan, won the case with Scopes being fined $100 (Berkman & Plutzer, 2010). An appeal to the Tennessee Supreme Court ended with a reversal of the lower court's decision based

on the technicality that the jury should have issued the fine rather than the judge. Instead of sending the case back to the lower court, the Tennessee Supreme Court dismissed the case. This case brought the controversy of the creation-evolution debate firmly into the public consciousness.

The United States public school systems are more volatile today. Both sides of the creation-evolution debate have defined their cause with each having strong supporters and financing. Both groups have realized the future of their respective camps rests with millions of students currently attending publicly funded schools. Opinions and beliefs vary greatly from state to state, within districts of the same state, and even within biology classrooms from the same school. Legislators, scientists, parents, and teachers' organizations have given input on what should be included in school curricula, how it should be taught, and exactly how much time should be given to the differing viewpoints (Berkman & Plutzer, 2010).

Since the Scopes trial, many who discount the theory of evolution have overtly or subtly attempted to influence public opinion as well as local and state laws (Berkman & Plutzer, 2010). As Christians opposed the teaching of evolution, the Supreme Court has often ruled that teaching any form of creationism is a violation of the "separation of church and state" doctrine. For example, in *Epperson v. Arkansas* (1968) the Supreme Court ruled that a ban forbidding the teaching of evolution in schools was unconstitutional. Allowing both the creation and evolutionary models to be taught became a tactic, but both *Daniel v. Waters* (1975) and *Edwards v. Aguillard* (1987) ended with the ruling that creationism was not to be taught at all. More recent cases involving intelligent design, such as *Kitzmiller v. Dover* (2005), have reignited the debate. The courts, however, continue to rule any teaching other than evolutionary theory to be a religious doctrine and, therefore, unconstitutional (Lac, Hemovich, & Himelfarb, 2010).

In order to have a greater understanding of the range of Christian beliefs, Gibson and Frances (1996) created a measurement called the Christian Fundamentalist Belief Scale. This allowed them to classify and define fundamentalists as believing that God created the world in six days, that Jesus Christ was the Son of God, that there is a hell, and that miracles have occurred. Fundamentalists believe Jesus died, was resurrected, and will one day return to earth. Further work by Cobern, Davis, Loving, and Terpstra (2011) showed how the rephrasing of religious questions could yield different results, so extreme care needed to be taken in categorizing an individual based on their survey responses. Although individuals may not self-describe themselves as such, a continuum appears to exist with the classification for conservative Christians becoming more specific throughout the layers of fundamentalist, born-again, and evangelical. This study regarding public school biology teachers will use the general term Christian when referring to research participants.

Belief in a special Creation by the God of the Bible is considered a core teaching for evangelical Christians and to deny it as a literal, historical event would be tantamount to denying the foundation of scripture. In the past, scholars have arranged the canon of scripture with the first recorded words being, "In the beginning, God created the heavens and the earth" (Genesis 1:1, ESV). Genesis 1 continues with the order of creation occurring in six days and with God resting on the seventh. Chapter 2 of Genesis reveals the more detailed account of the beginning of mankind with information being presented about Adam and Eve.

The teachings of Jesus Christ backed up the message of man's origin occurring during the creation week when He answered questions about marriage and divorce. For example, He questioned his adversaries, "Have you not read that he who created them from the beginning made them male and female?" (Matthew 19:4, ESV). In addition, the apostle Paul referred to a

divine origin when he said, “For we know the whole creation has been groaning with the pains of childbirth until now” (Romans 8:22, ESV). Christian fundamentalists cite passages in the Old Testament, the Gospels, and the letters of the New Testament to support their belief that any origin’s theory must keep the basic message of Genesis literal, foundational, and as a central part of their accepted doctrine.

Over the past 40 years Christian apologetics organizations, such as Apologetics Press, Answers in Genesis, and the Institute for Creation Research have provided doctrinal, historical, and scientific resources for individuals and churches. Many Christians feel they are in the midst of a spiritual battle (Cobern et al., 2011) and rely on these Christian evidence groups for their resources. Though there are differences in their approach and services offered, the core principle of defending the Bible and promoting a creation-focused, young earth biblical worldview is common to all evangelical Christians.

Although the emphasis of the apologetics groups and fundamentalist churches has been to promote the Genesis account, they have welcomed the cultural infusion of attention brought about by the Intelligent Design (ID) movement. Intelligent Design is the belief that evolution is too complex to have occurred accidently and life must exist through the intervention of a supreme being (Major, 2000). While evolutionary supporters believe that ID is creationism repackaged (Binder, 2013) there are numerous ID proponents who do not believe in the God of the Bible. When the number of those who believe in creation or ID are added to those who believe God either started the evolutionary process or believe in a figurative account of Genesis with each day of creation occurring over millions of years, a large percentage of the United States population reject some tenet of biological evolution (Newport, 2012). For instance, a 2012 Gallup poll showed that 46% of Americans believe God created humans in their present

form within the past 10,000 years and 15% believe humans evolved and God had no part in the process (Newport, 2012). The remainder of the population merges the two positions into a theory that is more palatable for them.

Teachers have not been idle observers in the cultural struggle for an acceptance of origins theory. In the past two decades numerous studies have been conducted among high school and college biology students and teachers. Berkman and Plutzer (2010) noted that in their background research they reviewed 25 studies from different states; they sought to provide a quantitative picture of the beliefs and practices for high school biology teachers in the United States. After conducting their national research, they discovered 12% of biology teachers believe fully in Darwin's theory, 21% endorse creationism or Intelligent Design, and the other 67% represent varying degrees of belief and practice (Berkman & Plutzer, 2010).

A variety of research ranging from both the young earth Christian, to the naturalistic evolutionist and all those between, have been conducted on teachers from various denominations, non-Christian world religions, and from teacher training programs. These include Muslim biology teachers in Turkey, (Kose, 2010), Lutheran biology teachers across the United States (Schulteis, 2010), and pre-service biology teachers (Moore & Cotner, 2009; Nehm, Kim, & Sheppard, 2009). These studies were conducted with the assumption that evolution indeed occurred and those who opposed biological evolution were wrong in their understanding of science (Kose, 2010; Moore & Cotner, 2009; Nehm et al., 2009; Schulteis, 2010). Lac et al. (2010) went further and worked to identify predictors of support for creation and found surprisingly that among the American public, education level was more of an indicator than religiosity.

The literature shows that some proponents of evolutionary theory are more hostile in their assertions than others. For example, Losh and Nzekwe (2011) conducted a study in which they examined "pseudoscience" beliefs of education majors. Among the topics covered were creationism, magic, aliens, and ghosts. The comparison of creationism to magic and ghosts clearly demonstrates antagonism for creation beliefs. Moore and Cotner (2009) used the term "educational malpractice" (p. 434) to describe the introduction of creationist teaching.

Other researchers, Astley and Francis (2010), denounced the tactics of evolutionists such as Richard Dawkins and suggested teachers help their students find the common ground between evolution and creation. In a study that asked the question, "Is anti-science sentiment associated with increasing orthodox Christian beliefs?" (Cobern et al., 2011, p.2) the evolutionary-supporting authors sought to determine if the claim made by many evolutionists, that Christians are anti-science, is true. Their conclusions showed that Christians were not anti-science, even if they were anti-evolution, and their suggestion was that evolutionary supporters should soften the "cultural warfare" metaphors.

Because those who advocate creationism do so out of belief, the conceptual framework that guided this study of biology teachers who believe in the Genesis creation was an interwoven matrix of the works of Bandura (1977) and Schoenfeld (1998). Bandura's (1977) work on self-efficacy developed out of social cognitive theory as the need arose to more clearly articulate and frame a unique and separate phenomenon from the greater social cognitive movement. Self-efficacy has been studied in a variety of professions where the focus is on how the individual perceives themselves in regards to their confidence level and whether they believe they are effective in their work. The teaching field has benefited through research in the realm of self-

efficacy and several studies have been conducted dealing with science teachers in particular (Schoon & Boone, 1998).

Similar to Bandura's (1977) studies of efficacy, Schoenfeld (1998) had worked to develop teaching in context theory. He believed the key to understanding teacher actions involved three areas: Knowledge, Goals, and Beliefs (KGB). Torner, Rolka, Rosken, and Sriraman (2010) applied Schoenfeld's (1998) KGB model to understand teachers' actions in the classroom and subsequently pointed out the origins of the model, explaining that Schoenfeld followed and explored related theories that made up the various parts of his KGB model. His work rests on the studies dealing with reasoning and problem solving primarily in the realm of mathematical learning and how a teacher's goals and expectations influence their decision making. How teachers view themselves as Christian biology teachers and how they implement their goals based on the knowledge they have within their belief system grounded this study of Genesis-believing public school biology teachers within reliable schools of thought.

The lack of information about the experiences of creation-believing biology teachers impacts more than just the teachers themselves. As the creation-evolution controversy continues, evolutionary researchers will not be able to have an effective dialogue if they do not understand the foundational belief structure or pedagogical techniques used. Up to this point, the dialogue has surrounded who teaches what, rather than why they make the choices they do. The results of the present study will provide insight and a greater understanding of the rationale and decision making process that public school biology teachers who believe in Genesis creation follow. The information gathered in this study will allow for a greater understanding of the actual practice of a large number of public school biology teachers and will act as a stepping stone toward more cordial communication.

Therefore, it was hoped that the results of this research would reveal how Christian teachers who believe in a literal account of Genesis view themselves. This study revealed how teachers view the curriculum and how they reconcile their beliefs with the state standards.

Situation to Self

I have always had a strong interest in science and, as a Christian, believe that God is the Creator of the universe and that He did it according to His revealed Word as given in the book of Genesis. I am also a minister which demands that I am very public with my faith. Having moved from a Christian school to a public elementary school years ago I had to make many faith-based decisions that created friction within the classroom setting. These decisions were not anything the students would notice but rather subtle changes in order that I would not violate my conscience or convictions. Throughout this study I have bracketed myself outside of the research through reflective journaling, separating my experiences, in order to understand the overall picture of what it means to be a high school biology teacher who believes in a literal understanding of Genesis (see Appendix A).

I have revealed how other Christian fundamentalist teachers who believe in a Genesis creation reason out the conflict between their faith and their profession. Christians, like any other teachers need to be empowered to be more effective and this will occur if they are more confident with the intersection of their faith and profession. This study in itself is not necessarily the tool of empowerment, but if those in positions of leadership can have a greater understanding of what Genesis-believing biology teachers go through, perhaps better guidance can be provided. I also do not believe that most of the scientific community understands the Christian who has a strong affinity for science. I have also presented greater insight into this group of teachers to help reframe the dialogue over the creation-evolution debate.

The study has been viewed through the paradigm of social constructivism. According to Creswell (2007), the researcher's purpose in social constructivism is to interpret the meanings the participants have about the world in which they live and work. Questions in this study have been broad in order to construct meaning from the common experiences. Social, historical, and cultural evaluations have also been reviewed and interpreted.

Problem Statement

The problem of this study is the gap in the literature relevant to understanding the experiences of secondary public school Christian biology teachers who believe in a literal six day, 24-hour understanding of the Genesis account of creation having occurred within the past 10,000 years. Current research recognizes that biology teachers who self-identify as young-earth creationists are in the public schools (Berkman & Plutzer, 2010; Lac, et al., 2010) and that they alter their teaching practices to support creationism (Moore & Cotner, 2009). However, regarding their pedagogy or any internal or external struggles they face, the literature is silent. For example, a study that examined creationist beliefs between biology and non-biology majors, concluded, "Likewise, qualitative studies would further elucidate the thinking behind close-response choices such as why so many biology teachers prefer that students personally believe creationism or why some teachers of high religiosities report no conflict with a scientific worldview" (Nehm et al., 2008, p.1141). Therefore, a current study was necessary in order to better understand this young-earth believing segment of public school biology teachers.

Purpose Statement

The purpose of this transcendental phenomenological study was to understand the experiences of secondary public school Christian biology teachers who believe in a literal six day, 24-hour understanding of the Genesis account of creation having occurred within the past

10,000 years. For this study belief was defined as "information that a person accepts to be true" (Kaballa & Crawley, 1985, p. 223).

Significance of the Study

This study is important because it is necessary to understand the experiences of secondary public school Christian biology teachers who believe in a literal six day, 24-hour understanding of the Genesis account of creation having occurred within the past 10,000 years. These experiences may include internal struggles and decision making, curriculum choices, and any friction or relational issues they may have had with others throughout the course of their teaching. Through an understanding of the personal beliefs and experiences of biology teachers who believe in creation, perhaps greater communication and rational thought will prevail and much of the hostility that has been expressed on both ends can find a collegial forum. This qualitative research study will help add credence to those who acknowledge that biology teachers who believe in a special creation are not anti-science (Cobern et al., 2011).

It is important for teachers to understand the reasons and rationale behind their own belief of origins theory. One desired result of the study was to identify the common struggles of biology teachers in order to provide a step in building their confidence and self-efficacy. In a 2004 study involving the pressures, stress, and coping of teaching evolutionary biology, Brem and Griffith noted, "Understanding what teachers need to be more comfortable and confident in their profession is crucial to the future of effective teachers and scientific literacy in public schools" (p. 791). In today's high stakes testing environment the pressures for promoting student mastery are higher than ever, although, there is a good deal of variation between states (Berkman & Plutzer, 2010). It is important to understand how a biology teacher who does not believe or teach evolutionary theory would consider themselves successful if the measurement of student

proficiency runs counter to their beliefs. Furthermore, an understanding of any teacher subgroup whose teaching approach has the potential to impact student comprehension is noteworthy regardless of personally held beliefs.

Efficacy theory may help in understanding whether a person wears down or becomes more resolute when dealing with daily stressors. Bandura (1977) noted that those who had high levels of efficacy displayed greater effort and were more resilient in times of adversity. The more confident a teacher is about any area of his or her teaching practices, the more it will translate into effective classroom instruction (Henson, Moreno, Roberts, & Tharp, 2001). Although the intention had not been to promote creationism, the conclusions about self-efficacy apply:

> Because self-efficacy has such an important relationship to teaching and student achievement, it is therefore important for educators to find other causes for poor self-efficacy. In spite of the fact that what causes poor or good self-efficacy in one person may not do so for another, and that many causes may work together to promote good or poor self-efficacy, it behooves educators to ferret out those attributes that contribute to teachers' beliefs about science and science teaching. (Schoon & Boone, 1998, p. 565)

If indeed a creation-believing teacher is experiencing adversity from societal pressure and is continuing in the teaching profession, it would be beneficial to understand the link in their efficaciousness and present and past experiences. If student success is the ultimate measureable outcome of education, all influences upon teachers are worth exploring. The purpose of this study was to understand the experiences of secondary public school Christian biology teachers who believe in a literal six day, 24-hour understanding of the Genesis account of creation having occurred within the past 10,000 years.

Research Questions

In keeping with the paradigm of social constructivism, the research questions of this study are broad and general. The central question of the study is: What are the experiences of Christian public school biology teachers who believe in a literal understanding of the book of Genesis? From the evolutionary perspective, Berkman and Plutzer (2010) provided a national portrait of American biology teacher beliefs and practices. Their results provide quantitative insight into the numbers and demographics, but do not delve into the human experience of belief systems. This study will illuminate the various experiences of Genesis-believing public school biology teachers and will provide insight into their thinking, teaching, and rationale for specific decisions.

In addition, the studies that deal with self-efficacy and belief systems (Torner et al., 2010) show a strong connection between belief, self-perception, and action. Therefore, the purpose has been to show a greater understanding of how the internal views of teachers impact their choices within the classroom. Sub-questions that have addressed this are:

1. How do the teachers perceive themselves in terms of being a Genesis literalist in the public school system?
2. What external conflicts have arisen as a result of the teachers' beliefs and practices?
3. What internal conflicts and struggles have arisen as a result of the teachers' beliefs and experiences?
4. How have the teachers responded to internal or external conflicts?
5. How do the teachers navigate their beliefs and practices in light of conflicts and evolutionary expectations?

As an insider, I hoped to display a transparent view of how creationist teachers think and why they make the decisions they do.

Research Plan

A transcendental phenomenological design was used to identify the common experience of what it means to share a literal belief in Genesis while teaching biology in a public school. This study sought to understand the core phenomenon of creation-believing public school biology teachers. I bracketed myself out of the research through reflective journaling and distanced my own personal experiences from those of the participants (Moustakas, 1994). The research participants were American high school biology teachers who taught in public schools. Data were collected through interviews, participant reflective journaling, focus groups, and the Science Teaching Efficacy Belief Instrument. Data were coded and organized thematically (Moustakas, 1994) and included both internal and external experiences. A final synthesis was crafted, detailing the essence of the creation-believing public school biology teacher.

Delimitations

This study delimited the participants to high school biology teachers who taught or had taught in public schools within the United States. Additionally, the study participants must have acknowledged their belief in the biblical book of Genesis and that God created the universe, earth and mankind in six literal, 24-hour days within the past 10,000 years. There is a lack of understanding in the literature of both the experiences and decision-making process of these teachers indicating the need for a greater knowledge of this group of teachers.

Definitions

1. *Belief* - Beliefs are mental constructs that represent the codifications of people's experiences and understandings (Schoenfeld, 1998).

2. *Goals* - Goals are something one wants to accomplish (Schoenfeld, 1998).
3. *Knowledge (pedagogical content)* - Pedagogical content knowledge is (a) the teacher's overarching conception of the purposes for teaching a subject matter, (b) knowledge of students' understandings and potential misunderstandings of a subject are preconceptions, misconceptions, and alternative conceptions about topics, (c) knowledge of curriculum and curricular materials, and (d) knowledge of strategies and representations for teaching particular topics (Grossman, 1990).
4. *Self-efficacy* - Self-efficacy is the extent or strength of one's belief in one's own ability to complete tasks and reach goals (Bandura, 1977).

Summary

This study has examined the experiences of public school biology teachers who believe in the literal account of the Genesis creation. Participants were screened and then interviewed, asked to respond to various situations, and completed an efficacy belief instrument. Select participants were asked to participate in a focus group in order to better triangulate emergent data. Distinct themes were identified from participant experiences.

CHAPTER TWO: LITERATURE REVIEW

Introduction

Christian educators who believe in the Bible as the revealed, inspired word of God, and Genesis as a literal account of the origin of the universe, make up a small percentage of public high school biology teachers (Berkman & Plutzer, 2012). Although there are also a relatively low number of teachers who could be termed naturalistic evolutionary purists, there is a large percentage who have attempted to harmonize their faith with Darwin's theory of evolution (Berkman & Plutzer, 2012). The literature revealed a variety of beliefs and practices within public school biology classrooms (Lac et al., 2010); the history of origin theories is one of conflict in religious, political, and educational circles. The American public school classroom has become the center of the issue with the teacher oftentimes making the decision on how they will approach origin theories.

Theoretical Framework

This study was guided by an interwoven theoretical framework based on self-efficacy, which arose out of Bandura's Social Cognitive Theory (1997) and the more recent work of Schoenfeld's (1998) Teaching in Context. Together Bandura (1997) and Schoenfeld (1998) created a web of reason which supports understanding the rationale of the creation-believing biology teacher and how their beliefs translate into classroom decisions.

Self-Efficacy

According to Albert Bandura (1977), one's self-perception directly shapes thoughts and actions. As with many theories, Bandura's work drew from other well-established beliefs within the social and psychological disciplines. Bandura's (1977) Self-Efficacy Theory grew out of the social cognitive movement. Bandura (1977) worked from a therapeutic perspective and believed

in order to initiate behavior change, cognitive processes in terms of motivational factors needed to be re-conceptualized. He theorized that individuals needed to believe it was possible for their desired outcome to be achieved, otherwise if serious doubts were in place they would not be in the frame of mind to alter their behavior or achieve their goals.

Bandura (1977) also believed that a mixture of incentive and expectation of reward worked together to produce positive outcomes. He said that if one has the appropriate skill level and the proper motivation, this will be a "major determinant of people's choice of activities, how much effort they will expend, and of how long they will sustain effort in dealing with stressful situations" (p. 194).

Self-Efficacy Theory has matured throughout the decades and has been applied throughout the field of education. Scholars noted that if teachers have a self-perception that they can do a good job and help students learn, they will indeed do a good job (Hewson, Kerby, & Cook, 1995). Understandably, teachers appear to have a lower self-efficacy of their ability in a particular content area when they lack knowledge about the subject; therefore, this would apply to science instruction as well. Schoon and Boone (1998) noted a 1983 report by Feistrizer and Boyer in which they stated "science concept understanding among elementary teachers was at 'an undesirable, seriously low level'" (p. 554). Digging deeper, however, Wenner (1993) found a negative correlation between science knowledge and self-efficacy. Knowledge in and of itself does not translate into reduced anxiety or a desire to provide greater depth.

Scharmann and Orth Hampton (1995) believed that offering pre-service teachers a quality science methods course could contribute to a greater desire for elementary teachers to be more comfortable with science instruction. In a study done to determine what alternative conceptions were held by preservice elementary teachers in determining a relationship with self-efficacy,

Schoon and Boone (1998) concluded that holding incorrect conceptions about science "does not greatly interfere with a person's ability to cope in today's world or even to learn more science" (p. 565). Schoon and Boone (1998) emphasized, as did previous researchers Scharmann and Orth Hampton (1995), that they did not believe science teaching efficacy ought to be left to chance but rather should be an intentional part of science teacher preparation.

In a study that examined the relationship between strain factors, teacher efficacy, and burnout, Skaalvik and Skaalvik (2007) examined the negative experiences of teachers in order to determine any causal factors. Possible causes of stress leading to emotional exhaustion, which were among those examined by Skaalvik and Skaalvik, included student behavioral problems, conflict with parents or fellow teachers, or altering instruction due to school reform. The authors concluded that there was "a particularly strong correlation between teacher self-efficacy and teacher burnout" (Skaalvik & Skaalvik, 2007, p. 613).

High school biology teachers already have a great number of stressors affecting their work. Prior to this study it had been unknown if the biology teacher who self-identifies as a Genesis literalist or young earth creationist faced more stress than biology teachers who hold a naturalistic worldview. This study examined whether there is friction between what is believed as defined through faith and what is required to be taught. Self-efficacy is of interest in regards to how confident the teacher is in being able to defend and articulate their views in the midst of perceived conflict and how well they are able to manage the involved stressors and continue teaching.

Teaching in Context

Mathematician Alan Schoenfeld developed a theory throughout the course of his lifetime called *teaching in context.* He sought to provide an explanatory framework that would reveal

how the knowledge, goals, and beliefs of teachers translated into their actual practice. Schoenfeld (1998) introduced his theory by saying, "Our intention is to provide a detailed theoretical account of why teachers do what they do *on line* –that is, while they are engaged in the act of teaching" (p. 1).

Knowledge

A distinction is made between what one knows and how that knowledge is organized. Schoenfeld (1998) relied heavily on Borko and Putnam's 1996 review which set out a framework for evaluating the beliefs and content knowledge of teachers. These include general pedagogical knowledge, which includes knowledge about teaching, learning and learners, subject matter knowledge, meaning information and concepts required to teach their discipline, and finally, pedagogical content knowledge which Schoenfeld identified as relying on the work of Grossman (1990). Grossman's four major components are:

> a) the teacher's overarching conception of the purposes for teaching a subject matter, b) knowledge of students' understandings and potential misunderstandings of a subject are preconceptions, misconceptions, and alternative conceptions about topics, c) knowledge of curriculum and curricular materials, and d) knowledge of strategies and representations for teaching particular topics. (p. 23)

Knowledge appears to be the foundation upon which goals and beliefs rest.

Torner et al. (2010) attempted to use Schoenfeld's theory of Teaching in Context, using the Knowledge, Goals, and Beliefs (KGB) model to help explain the actions of teachers and the decisions that led to those actions. After evaluating teacher lessons and reviewing the data of the study, they acknowledged the "KGB framework [provides] convincing explanatory power" (Torner et al., 2010, p. 417). There is still uncertainty as to whether belief theories should be

developed separate from those based on knowledge, but it is not denied that a teacher's goals and actions are based upon their beliefs.

Goals

Goals are defined as "something you want to accomplish" (Schoenfeld, 1998, p. 21). Teaching in Context Theory recognizes that some goals may be formal while others may not be articulated. There may be different activation levels at which goals take place, with some being overarching and being present in some form throughout instruction. Goals may be either short- or long-term and may be thought out in advance or emerge during the action of teaching.

Beliefs

Schoenfeld (1998) defined beliefs as "mental constructs that represent the codifications of people's experiences and understandings" (p. 19). He recognized that teachers have beliefs about their topic, learning, individuals, classes, and the environment in which they work. He said, "People's beliefs shape what they perceive in any set of circumstances, what they consider to be possible or appropriate in those circumstances, and the knowledge they might bring to bear in them" (p. 19). Schoenfeld identified major components of belief summarized from previous works: "Beliefs have a strong shaping effect on behavior" and "there is a major difference between professed beliefs and attributed beliefs" (p. 19). Beliefs, therefore, are integral in understanding the actions of why teachers do what they do.

Self-efficacy theory and teaching in context grounded the study within a reliable framework. Both Bandura (1977) and Schoenfeld's (1998) work provided a foundation in which to explore the experiences today's creation-believing biology teachers have had. The results of this study could lead to greater efficaciousness because of insights that will be available to

leaders in teacher training programs as well as for those in administrative positions who desire to develop competent teachers with a high degree of confidence.

History of Evolutionary Theory

In 1859 Charles Darwin formalized the Theory of Evolution which he revealed in the book: *Descent of Man: On the Origin of the Species*. Darwin, who was fascinated by the natural world and the diversity of species, journeyed throughout the world studying living creatures. One such voyage took place on the famous ship, *The Beagle*, on which he journeyed around the world with the most well-known stop being on the Galápagos Islands.

Darwin and his contemporaries such as Ernest Haeckel, Thomas Huxley, Asa Gray, and Charles Lyle (Gutek, 2005) made it fashionable to believe in explanations of the beginning of life without the influence of religion. Many were more than happy to shrug off what was considered the burden of religion, while others struggled with the concept of the absence of God.

In its original form, Darwinian evolution proposed the concept that life changed over time through incremental changes. These changes, called mutations, would provide some benefit to the organism enabling it a better chance for survival and thus be able to reproduce and pass on the beneficial characteristic to its offspring. Organisms that did not have the characteristic would not have had as great a chance for survival. Darwin termed this mechanism, *natural selection* which gave rise to the phrase, *survival of the fittest.*

Evolutionists consider these principles beyond dispute and are considered *fact* to have happened (Berkman & Plutzer, 2010). A source of angst for evolutionists is what is considered the misapplication of the word "theory." A common lament is that the general public uses the word theory in a generic sense, much like the term guess or hunch. As described by the National Research Council (NRC, 2012) a scientific theory is constructed "based on bodies of knowledge

and evidence, are revised in light of new evidence, and must withstand significant scrutiny by the scientific community before they are widely accepted and applied" (p. 67).

Others reinforced and promoted Darwin's work. Perhaps the most famous of his day was Thomas Huxley, who became known as "Darwin's Bulldog." Huxley was adamant in his defense of evolutionary theory and became a prominent spokesman. Huxley is credited with coming up with term *agnostic*, which means that knowing God's existence cannot be known (Collins, 2006).

Additionally, Bleckmann (2006) observed that "Alfred Russel Wallace's lectures on protective coloration was the first largely technical presentation of evolutionary theory to appear in [the journal] Science" (p. 152). Wallace focused on the mechanism for change and noted that several others had questioned whether species were fixed in their current form. Wallace inferred that most fit organisms would live and go on to reproduce. However, he believed that the human mind was exempt from this process and that man's soul "springs from a higher source" (Bleckmann, 2006, p. 152).

As the discipline of biology grew, so, too, did the connecting webs of evolutionary thinkers. All of biology, and in fact other disciplines, came to be viewed through the lens that evolution was indeed true and no longer questioned by "serious" scientists. Assumptions were made and developed with the understanding that evolution was fact and undisputable. The conflict remained in the background of American culture until the Soviets launched Sputnik. A concern arose that American science was inferior to foreign adversaries and a push toward advancing math and science began. Throughout the next few decades standards were released and revised to address national interests. Evolutionary biology was included in those changes

and has been refined as the theory itself has changed. The Biological Sciences Curriculum Study (1993) presented the following as necessary for high school evolution instruction:

a) Species evolve-change across time,

b) Species evolve from common ancestors,

c) New species form from existing species,

d) Evolution usually occurs gradually, and

e) Natural selection is the most important mechanism by which adaptive change occurs.

Alternative considerations are automatically rejected as either religiosity or pseudoscience. The prevailing thought today is repeated in the often used quote, "Nothing in biology makes sense except in the light of evolution" (Dobzhansky, 1973, p. 125).

Evolutionists cite several stalwarts for their evidence of evolution taking place. The similarity of species was one of the earliest Darwinian proposals. Biologists often reference the fossil record as solid proof. More recently DNA and specifically decoding of various genomes have found their way into the literature of evolutionary proponents. The current understanding of evolution is referred to as evolutionary synthesis (Smith, 2010).

Although the notion of God or a divine being has maintained a degree of strength in scientific circles, a strong faction remains that scientific pursuits and scientific literacy should be defined and promoted by those within the scientific community who are best qualified (Mooney & Kirshenbaum, 2009). Today's most outspoken pro-evolutionist is Oxford professor, Richard Dawkins. Dawkins has long riled both the scientific and religious communities by adamantly opposing any type of non-naturalistic compromise. Dawkins caused a greater than normal anger among Christians with the 2006 release of his book, *The God Delusion.* At the beginning of the chapter titled, "The God Hypothesis" he said:

> The God of the Old Testament is arguably the most unpleasant character in all fiction: jealous and proud of it; a petty, unjust unforgiving control-freak; a vindictive, bloodthirsty ethnic cleanser; a misogynistic, homophobic, racist, infanticidal, genocidal, filicidal, pestilential, megalomaniacal, sadomasochistic, capriciously malevolent bully. (p. 51)

Although scholars in the scientific community typically do not convey their disagreements with creationists with inflammatory words like Dawkins, there are those whose attacks are intended to provoke an outraged response. In the book *Unscientific America*, authors Mooney and Kirshenbaum (2009) explored what they perceived was a lack of scientific literacy in America. They described an incident involving University of Minnesota professor, Paul Zachary Myers, who acquired a communion wafer and then described his actions on his blog:

> I pierced it with a rusty nail (I hope Jesus' tetanus shots are up to date) and I simply threw it in the trash…My apologies to those who hoped for more, but the worst I can do is show my unconcerned contempt. (Mooney & Kirshenbaum, 2009, p. 96)

Many atheists denounced this tactic as in poor taste or at the very least invigorating to the opposition.

Although advocates of evolutionary education do not attempt to provoke hostility in their opponents, they express an emotional investment. For example, Berkman and Plutzer (2012) saw a direct connection toward acceptance of evolutionary theory and science competition with the rest of the world. They believed that if students were allowed an option in regards to origins theory and follow what is considered an unscientific practice, then it will impact future decisions regarding issues such as energy policy, the environment, and genetically modified foods. They

represented many evolutionary education advocates who believed embracing Darwinian evolution is the only possible solution to a vigorous and competitive scientific society.

Creation Beliefs

A 2013 *Harris Poll* showed 74% of Americans profess a belief in God (Shannon-Missal, 2013). At the polar end of the staunch evolutionists are those who believe that the God of the Bible created the universe and all life in six literal, 24-hour days as recorded in the book of Genesis within the past 10,000 years.

Between those who take Genesis literally and the Darwinian naturalists are those who attempt to find a common ground between evolution and special creation. These theistic evolutionists attribute some part of the observable world as being created by God but still look to evolutionary mechanisms to achieve our current makeup (Cobern et al., 2011).

Another group that may or may not be made up of those promoting a young earth are a part of what is called the Intelligent Design movement. Intelligent design advocates attempt to keep religion out of the dialogue and instead focus on the weaknesses in evolutionary theory and on the belief that there is evidence of a designer. While some claim the designer to be the God of the Bible, not all adherents prescribe to a belief in the Christian God.

Intelligent Design

The Intelligent Design (ID) movement began in 1991 with Phillip Johnson writing that the Darwinian model was not sufficient to explain the complexity of life on earth. Examples such as blood clotting and the human eye were given as support (Collins, 2006). Also, contributing to the ID thinking was Michael Behe, a biology professor who wrote the book *Darwin's Black Box* (1996) in which he used the example of the complexity of the cell to show proof against evolution.

In a study examining the views of those who did not support nor believe in evolution, Cobern et al. (2011) concluded that being anti-evolution did not translate into being anti-science. The authors wrote that they hoped for a reduction of the *warfare* metaphor and that the scientific community should understand that science is still supported in general.

However, the American Astronomical Society in a 2005 letter in *Astronomy Education Review* articulated the general sentiment of the scientific community when they wrote, "Intelligent Design fails to meet the basic definition of a scientific idea: its proponents do not present testable hypotheses and do not provide evidence for their view that can be verified or duplicated by subsequent researchers" (Torres, 2009, p.28).

Theistic Evolution

Whether one is a scientist who believes in God or a Christian who attempts to reconcile evolution with their faith, theistic evolutionists often draw the ire from each of the other camps. Unlike Christian fundamentalists or evolutionary proponents, theistic evolutionists believe there is a happy medium to be reached. Sometimes the belief systems within the individual remain incompatible with the claim being that both positions are somehow true. Other times, thought out and rational explanations are developed in order to provide the theistic evolutionist plausible understanding of how the two ways of knowing can be meshed.

World-famous geneticist Francis Collins (2006), in his book, *The Language of God*, said, "Theistic evolution is the dominant position of serious biologist who are also serious believers" (p. 199). Elsewhere he fully identified himself in this camp when he wrote, "The God of the Bible is also the God of the genome. He can be worshiped in the cathedral or in the laboratory. His creation is majestic, awesome, intricate, and beautiful-and it cannot be at war with itself.

Only we imperfect humans can start such battles. And only we can end them" (Collins, 2006, p. 211).

Michael Dowd (2009) in his work, *Thank God for Evolution*, renamed theistic evolution *Evolutionary Christianity* and zealously promoted his understanding of science and religious teachings. He referred to fundamental Christianity and a literal interpretation of scripture as *flat earth religion*. Dowd traveled extensively with the belief that "a holy understanding of evolution will usher the world's religions into their greatness in the 21st century" (p. 75).

Perhaps summarizing the implications and beliefs of theistic evolutionists, Gerald Schroeder (1997) wrote,

> The Bible relates in thirty-one verses, in a few hundred words events spanning sixteen billion years. These are events about which scientists have written literally millions of words. The entire development of animal life is summarized in eight biblical sentences….It is modern science that has come to match the biblical account of our genesis. (p.70)

Although theistic evolutionists perhaps attempt to take on the role of the peacemakers between the evolutionists and creationists, their rebuke of what is considered unscientific is noticeably harsh. For example, Collins (2006) noted:

> Young Earth Creationism simply cannot be accommodated by tinkering around the edges of scientific knowledge. If these claims were actually true, it would lead to a complete and irreversible collapse of the sciences of physics, chemistry, cosmology, geology, and biology. (p. 174)

Genesis Creation

Those who believe in young earth creation take their belief and instruction from the early chapters of the book of Genesis. Some have never considered any other argument and believe that assigning a figurative account to Genesis would be the equivalent to denying divine revelation.

The first two chapters of Genesis explain biblical creation in three segments. The first segment is overall explanation of the creation of the universe: "In the beginning, God created the heavens and the earth. The earth was without form and void, and darkness was over the face of the deep. And the Spirit of God was hovering over the face of the waters" (Genesis 1:1-2, ESV).

The following verses then expand the account and offer a chronology of the creation week. The items mentioned over the six-day narrative include light, land, plant and animal life, astronomical objects, birds and sea creatures, land animals, and humans. Chapter two of Genesis then magnifies day six in greater detail, chronicling the creation of man and woman.

Based on the lens of biblical literalism, common arguments of evolutionists are discounted. For instance, there is a distinction between the modern day definition of a "kind" and the current classification system based on the evolutionary tree of life. The fossil record, including the geological concept of stratified rock layers, is believed to be in their current state due to the results of the global flood of Noah which is recorded in Genesis 6-9. In fact, the three greatest impacts of life on earth are considered to be reported in the Bible. These are the initial creation itself, the entrance of sin and death into the world, and the Noahaic flood and subsequent species and climatological changes.

At times the evidence for creation does not seem to be emphasized as much as the goal seems to be negating evolution. A major strategy of the anti-evolutionist is to cast doubt

regarding the age of the earth. The most dedicated evolutionist will acknowledge that long spans of time would have to be necessary for speciation to occur. If it can be shown the earth is only a few thousand years old, then the creation strategists believe the evolutionary arguments will crumble (Thompson, 2001).

A topic that gets considerable attention from creationists is the topic of dinosaurs. They believe the dinosaurs were created on day six of creation along with all other land dwelling creatures, including humans. References are made to the behemoth and leviathan mentioned in the book of Job as well as to ancient cultural references to dragons. To support the view that humans and dinosaurs lived together, Ica stones from Peru, petroglyphs of the Nazca's, Mexican figurines, and a carving of a stegosaurs on a Cambodian temple are used as examples (Harrub, 2010).

Since evolutionary theory's introduction there has continually been resistance to what has been considered blasphemy and anti-God. In recent decades there has been an emergence of scientists with credibility in their field who defend their Christian faith and young earth views. The general public has gained confidence with the acceptance of so many from the various fields of science as well as from the continual reinforcement of church leaders. These forces have merged in the formation of several apologetics and Christian evidence themed media outlets. The apologetics organizations have provided original research, reasoned through evolutionary arguments, and instruct through web, print, and lecture forums. Together this has allowed for enough information to be disseminated that the necessary resources are available for the curious and those who see themselves as advocates to articulate their position with confidence.

The Current Debate

Today, the debate over origins has spread throughout American society. In some circles, belief in either view can make or break a career. Advocates on each of the extremes consider there is no room for compromise, while those in the middle attempt to have a generally accepting view of both, which in turns causes them to be equally polarized from the other two. Churches, political organizations, and educational institutions all seek to gain control of what will be instituted as policy or doctrine (Berkman & Plutzer, 2012). Interestingly, much of the literature shows all parties feel defensive as if they are in the minority and are oppressed by the other (Long, 2011; Smith, 2010).

Christians point out the conservative nature of the founding fathers of the United States (Miller, 2008). Part of their strategy involves teaching through churches, publications, and apologetics organizations that not allowing the Genesis account of creation to be supported in the public realm is as an attack not only on the Christian faith, but also on traditional American values. Evolutionary theory is often viewed as a reason for the Christian argument of America's moral decline.

In the chapter, "Bruising Their Religion," from *Unscientific America*, Chris Mooney (2009) stated:

> The specific claims of so-called scientific creationism-that the earth is no more than 10,000 years old; that its geological features, such as the fossil record and the Grand Canyon, were carved by Noah's flood; that humans coexisted with dinosaurs; and so on-have been wholly dismantled by scientific experts. The same goes for various claims made by the newer intelligent design movement, such as the assertion that certain cellular components are "irreducibly complex," and therefore suggest the hand of an intelligent

> designer (God). The scientific case for rejecting such bad science (or non-science) is indisputable. (p. 99)

As of 2014, the debate continues in a variety of forums. State curricula, open court cases, and lobbying and legal organizations push for change, seeming to sense that this is a crucial time in American science and education. Current research is being done and both creation and evolutionary based organizations are aggressively promoting their own views.

The American Public Schools

American public high schools have become the battleground for the creation versus evolution debate (Long, 2012). Both sides of the issue realize the future of their particular theory rests with today's youth. Beliefs are already established by the time students exit high school and enter college with many being entrenched in the worldview of their family. For nearly a century school boards, churches, parents, state legislatures, and the courts have all worked to set policy. Current research shows that the primary factor in the establishment of what is actually taught in high school biology classrooms rests with the beliefs and attitude of the teacher (Berkman & Plutzer, 2012).

The current conversation in the public schools regarding the creation versus evolution debate is one of constant friction. Both self-described liberal and conservative groups are at odds with each other over all aspects of the curriculum and what freedoms should be allowed to teachers and students. Religion, specifically Christianity, in the public schools has been limited by the courts within the past century (Miller, 2008).

The public school setting is also currently embroiled in additional controversy with the introduction of the Common Core State Standards. The Common Core was a states-based initiative intended to encourage a voluntary adoption by the individual states. The Race to the

Top proposal showed the interest at the federal level as large amounts of funding were promised to states who competed for the funds, with one of the criteria being the adoption and implementation of the Common Core. Although not specifically a religious issue, many who consider themselves as conservative minded saw this as federal government overreach and an attempt to federalize the education system. Since the Common Core's inception a conservative outcry has caused many states which were once supporters to opt out.

The Common Core provides guidelines in the realm of English Language Arts (ELA) and Mathematics, leaving the states with greater flexibility to develop their own science and social studies curriculum. Science curriculum has long had a more national focus than other disciplines, but continuity between states has long been a weakness proponents of a national standard have claimed. In 2012, the National Research Council of the National Academies released *A Framework for K-12 Science Education: Practices, Crosscutting, Concepts, and Core Ideas*. The intent was to provide the scaffolding upon which future science curriculum standards could be based.

One point of emphasis among the ELA portion of the Common Core was to increase the amount of non-fiction text. Cheuk (2012) showed how the three disciplines of ELA, math, and science could be integrated. The points the three disciplines share are:

a) E2. Build a strong base of knowledge through content rich texts

b) E5. Read, write, and speak grounded in evidence

c) M3 and E4. Construct viable arguments & critique reasoning of others

d) S7. Engage in argument from evidence

In 2013, the Next Generation Science Standards (NGSS) were released based on the K-12 Framework. While many embraced the Standards as helping to unify the nation and increase

science mastery, others saw this as an attempt to reduce state influence in the selection and implementation of an educational standard. In discussing science benchmarks and the standards that are influenced by them, Long (2012) believed the standards worked to shape what are referred to as "habits of mind," and although many laud the testing of evolutionary concepts as a means to force standards to be taught, Long (2012) did not believe the standards would yield the result the pro-evolutionist desires.

The life science portion of the NGSS has four core ideas (Bybee, 2013) and includes: From Molecules to Organisms, Ecosystems, Heredity, and Biological Evolution. Core Idea 4, Biological Evolution: Unity and Diversity are divided into the following ideas:

1. Evidence of common ancestry and diversity: Biological evolution results from changing environmental factors and the subsequent selection from among genetic variations in a population that across generations changes the distribution of those characteristics in that population.
2. Natural selection: As environments change, organisms with variations of some traits may be more likely than others to survive and reproduce.
3. Adaptation: Natural selection is the mechanism by which species adapt to changes in resources or the physical limits and biological challenges an environment imposes.
4. Biodiversity and humans: Biodiversity is the multiplicity of genes, species, and ecosystems.

Bybee (2013) pointed out, "The four core ideas for the life sciences have a long history and solid foundation as the basis for the life sciences in school programs" (p. 11). The evolutionary scientific community has completely embraced the NGSS.

High stakes testing has also become a significant part of the educational landscape. The No Child Left Behind Act (No Child Left Behind [NCLB], 2002) states that all public high school students must be tested in science sometime during their high school years. A review of a various state educational websites showed that most states have chosen to give a biology exam. According to NCLB, this test is required whether or not the student has completed the tested subject, which has caused most states and local districts to make biology a mandatory requirement for graduation.

History of Conflict

During the early years of public education, the Bible was the primary resource for literacy and morality instruction (Miller, 2008). Throughout the 20th century a reinterpretation of the separation of church and state began to be asserted by atheists and evolutionary proponents. While the view grew in popularity and acceptance, Christian concerns were unheard. Much work has been done to inform the public that the separation in teaching came from a letter that Thomas Jefferson wrote to a minister informing him that the new government would maintain its distance from religious matters and would not interfere (Miller, 2008). This strategy fell on deaf ears, as many feel the principle as currently interpreted is in the spirit of the constitution if not the letter.

The 1925 Scopes trial in Dayton, Ohio was the result of teacher, John Scopes, violating the Butler Act, which the Tennessee legislature passed in order to prevent the teaching of evolution in public schools. The trial was dominated by three different themes. Berkman and Plutzer (2012) recorded them as (a) the substantive debate regarding the age of the earth and evolution taking place, (b) the procedural theme which reasoned how curricular policies should be set in public schools, and (c) the academic freedom of public school teachers. The trial

ultimately ruled on the procedural and academic freedom questions resulting in Scopes being found guilty and having to pay a $100 fine, with the fine being withdrawn due to a technicality.

Legal Status

Numerous challenges have been issued as creationists and those in the Intelligent Design movement have tried to change law and policy. Following the Scopes trial, evolution was absent from the textbooks for several decades. In *Epperson v. Arkansas*, a second year biology teacher began using a textbook with a chapter focusing on evolution. This was a violation of Arkansas law which made it illegal for teaching that humans came from lower animals. The Arkansas Supreme Court ruled in favor of the state saying it was a valid exercise of the state's right to set the curriculum. The U.S. Supreme Court, however, overturned the state in a 9-0 ruling which focused on the first amendment establishment clause. "In effect, the court said that state governments are free to determine their science curricula and select their own textbooks, as long as they do not favor a particular religious viewpoint as they do so" (Berkman & Plutzer, 2012, p. 19).

In an empirical study involving evolution, creationism, and Intelligent Design instruction in public school classrooms, Kristi Bowman (2007) explored in detail the relationship the non-evolutionary viewpoints have under the current understanding of the Establishment Clause. She cited the 1971 *Lemon v. Kurtzman* court case (often referred to as the Lemon test), as the first measure a questionable school topic must pass. She explained that two prongs of the Lemon test, purpose and effect, must be met. An outgrowth of the Lemon test is referred to as the "endorsement test." The endorsement test asks whether an outside observer would perceive the teaching or action as being a government endorsement of religion. The final test that is given when a practice comes into question is called the "coercion test." This was the result of the 1992

Court decision that found a prayer at a high school graduation to be unconstitutional because students were unable to withdraw from the assembly without being stigmatized (Bowman, 2007). These tests are not always used in full force and are noted to have been haphazardly applied.

Several strategies have been tried by anti-evolutionists. Arkansas said those responsible for the teaching of evolution-science and creation-science must stick to the evidence. The court rejected this in *McLean v. Arkansas* (1982) saying it was an attempt to introduce biblical creationism. Equal time was offered for all theories under a Louisiana law, but the Supreme Court ruled it unconstitutional and said that no level of government could endorse biblical creation.

In 1987 a challenge to a Louisiana law was heard by the Supreme Court in *Edwards v. Aguillard*. The Louisiana law required that creation science be presented whenever evolutionary theory is being taught. In a 7-2 decision the Court ruled the law was unconstitutional because it promoted religion. Chief Justice Rehnquist and Justice Scalia dissented and believed it should be sent back to the appeals court. The dissent Scalia wrote emboldened those who promoted creation as seen where "Scalia had written that the fundamentalists were entitled to have evidence against evolution presented in their schools" (Bleckmann, 2006, p. 157). The tactics changed in that the creation promoters began to seek classroom time to show evidence against evolution.

In 1999 the Kansas Board of Education attempted to remove references to evolution, theories about cosmology, and the view that the earth is billions of years old. The key points in the proposed revised standards were:

1) Add to the mission statement a goal that science education should seek to help students make "informed" decisions.

2) Provide a definition of science that is not strictly limited to natural explanations.
3) Allow intelligent design to be presented as an alternative explanation to evolution as presented in mainstream biology textbooks, without endorsing it.
4) State that evolution is a theory and not a fact.
5) Require informing students of purported scientific controversies regarding evolution.

The proposed standards were altered, but greater criticism of evolutionary theory was voted upon and enacted in 2005. In 2006 the conservative anti-evolutionist board members lost their seats, and in 2007 the new board voted to reject the amended standards.

Gibson (2004) noted the "renewed effort on the part of creationist organizations aiming to attack naturalism and secularism in the public schools rather than advocate for the inclusion of creationist curriculums" (p. 1136). The tactics to cast doubt on evolutionary principles has more recently followed the Intelligent Design movement. Moore and Cotner (2009) described the wedge strategy that has been used by Intelligent Design advocates. The incorporation of phrases such as "teach the controversy" and "irreducible complexity" have been successful in inserting their agenda in the public dialogue. The authors reluctantly acknowledged the success of this strategy.

In *Kitzmiller v. Dover Area School District* (2005) a challenge was issued to the local school board, which had created a policy that biology teachers read a statement which pointed students to additional information advocating Intelligent Design. Judge John E. Jones III ruled that the board policy violated the establishment clause (Berkman & Plutzer, 2012) because the district could not provide convincing evidence that ID could be separated from creationism.

Regardless of what legislatures, state school boards, or local communities propose, current law reveals that instruction for a religious purpose in public schools is against the law.

New strategies are continually being applied in order to test the boundaries of judicial acceptance. From wording in textbooks, to disclaimer stickers, a constant tension exists in the background of those driving the creation-evolution debate.

High School Classrooms

The overriding goal of science education has not been agreed upon. Nehm et al. (2009) recognized that there is no universal agreement upon what the instructional goals within the science classroom should be. The National Science Teachers Association heavily promotes evolutionary theory, though they do not speak for all biology teachers and even their members hold differing views. They question whether or not knowledge *and* belief are appropriate as an expected outcome or whether simply an understanding of evolution is sufficient. Cobern (1994) claimed that understanding is more important than believing.

In a study involving the religion and evolutionary beliefs of Christian university biology majors, Winslow, Staver, and Schamann (2011) found that the journey from creationism toward theistic evolution was a complex process that occurred only after the facts and implications had been weighed that would play out between family and faith. Some would argue that simply presenting facts in a non-biased fashion is what teachers at the high school level should promote, while others hope to instill acceptance of evolutionary theory.

Biology Teacher Research

The final link between content and student learning is the biology teacher. Within the classroom setting, it is by the teacher that state standards and textbook content either gets accepted, ignored, or rejected (Long, 2011). A teacher may or may not feel conflicted by their belief, but religiosity does have a significant impact on what is actually taught. White (2009) identified three areas the current literature dealt with regarding the influence a teacher's religious

identity had on the classroom. These include importance, implementation, and inclusion/omission. White went on to ask the question, "Is religion an aspect of a teacher's professional identity?" (p. 860). Discussed later, White emphasized the view of Knowles (1992) and said, "Research on teacher identities, their interests, and biographies is urgently needed because we have little knowledge of how teachers' early experiences affect their careers and strategies" (p. 861).

In a study on Arizona biology teachers titled, "Teaching Evolutionary Biology: Pressures, Stress, and Coping," Griffith and Brem (2004) identified three categories of teachers in regards to their perspective of teaching evolution. They categorized the teachers as *Conflicted,* meaning they struggle with their own beliefs; *Selective*, those who avoid difficult topics; and *Scientists*, who do not want social issues in the science classroom. Moore (2000) pointed out that additionally, some teachers will endorse and promote creationism.

Although the classification of scientists by Griffith and Brem (2004), have little bearing on this study, those of Selected and Conflicted do. The Selective teachers "attempt to create harmony by restricting the content of their classes during the evolution unit, and the expression of thoughts and feelings about the content" (p. 798). According to the authors, these teachers have developed effective coping mechanisms which will not require them to experience any emotional or intellectual discomfort, suggesting they may not themselves realize the mechanisms by which they cope. The authors suggested the most radical approach to structuring lessons was conducted by a teacher who chose not to teach evolution at all. This particular participant was the youngest and least experienced teacher. Griffith and Brem (2004) summarized the Selective teachers by saying they "have found ways to quell the anxiety that arises from internal,

situational, and external stressors through coping strategies that involve selectivity regarding content, classroom format, and content delivery" (p. 800).

The Conflicted teacher is similar to the Selective teacher in that they also experience a variety of stressors when covering evolution and believe there are consequences associated with it. The difference is that the Conflicted teachers "thoroughly explore the issues relating to teaching evolution with their students and with themselves" (Griffith & Brem, 2004, p. 800). The teachers who were identified as Conflicted appeared to have their stressors originate internally or through interactions with others, primarily students. They go to great lengths to comfort students while covering evolution. Griffith and Brem (2004) concluded that the Conflicted teachers are said to "feel stress because they feel that they must teach evolution, but that teaching it could have grave consequences for them and their students" (p. 801).

Like the Griffith and Brem (2004) study, much of the research has been conducted from an evolutionary point of view by evolutionary sympathizers. Goldston and Kyzer (2009) began sharing the findings of a case study involving southern biology teachers by providing the views of science-based institutions:

> Scientific organizations, including the National Academy of Science (NAS, 1999), National Association of Biology Teachers (NABT, 2000), American Association for the Advancement of Science (AAAS, 2002), and the National Science Teachers Association (NSTA, 1997) support the teaching of the theory of evolution as a unifying them in biological sciences. (p. 762)

This study concerning biology teachers who believe in Genesis creation thoroughly explores the tension that arises and the sociocultural situations that shape instruction, with the goal of the researchers seeking to "understand how teachers traverse the controversy that teaching evolution

evokes" (Goldston & Kyzer, 2009, p. 766). Unlike the present proposed study that explored teacher experiences from the creation-believing position, the Goldston and Kyzer study explored the teachers' view with nearly the opposite perspective.

Lac et al. (2010) observed that while many polls have been conducted showing relatively large favor for teaching creationism alongside evolution, little is known about those who share the view that "public schools should not teach evolution because the subject matter often contradicts their religious ideas and principles" (p. 254). While the legal status of any anti-evolution topic seems settled for now, the general public and a segment of public school biology teachers continues to support a creation model much to the dismay among evolutionary stalwarts (Berkman & Plutzer, 2010).

Long (2012) acknowledged what the creationist teacher is being asked to do within the public school and described the tension it may carry. He described what creation science teachers are expected to do when following curricula and policies that are in conflict with their belief. Long questioned,

> Is it ethically tenable-given the limits of the U.S. Separation Clause, and our tradition of upholding a defense of religious expression no matter what form? Can we demand, in the name of the state, that science teachers have X or Y view of reality? (p. 130)

This questioning and seemingly sympathetic approach is nearly absent in the literature, especially among the pro-evolutionists. For the most part an unwavering commitment to evolutionary teaching and an antagonism toward religious fundamentalism exists. Though Long (2012) supported the evolutionary perspective he acknowledged,

> Creationists are being asked to commit-epistemologically-to a suspension of the ontological commitment, putting the orthodox, knowledge system of science in front of

> their commitment to inerrant faith. By this, science educators are, whether actively or subversively, asking Creationists students or teachers –by the learning outcomes expected of the curriculum-to change their relationship to the epistemological authority of their religious commitments. (p. 129)

Setting aside what one knows to be true is difficult to expect and will likely arise only where the teacher's beliefs are not compromised.

Some teachers do not have the strain of ontological conflict, but rather embrace the challenge of defending and perhaps promoting their religious convictions. Schwartz (1997) described three distinctions Christians may be categorized as within the public schools. The first he described as the *Agent of Enculturation*, which feel God has called them to be an influence for good. Second, the *Christian Advocate/Evangelist* who see themselves as undercover agents working to promote Christianity with a possible motive of returning the country to its Christians roots. Finally, the *Golden Rule Truth Seeker* treats religious questions as normal and acknowledges the right of non-Christians to follow their own convictions. Schwartz's theory has direct implications for my study.

There are two schools of thought on how teachers come to terms with how they view themselves. White (2009) pointed out that some view teacher preparation programs as similar to assembly line productions which will socialize teachers toward a common identity. A more prevalent thought though is "to view teachers as being continually shaped by the dynamics of social practice, structure and history" (p. 861). In light of the previous descriptions of Christians by Schwartz (1997) and the concerns of both the religious and atheistic, White's (2009) words carry significant weight when she said, "One's personal identity cannot be separated from one's professional identity [and] these attributes indicate that religion is an influence on the

construction of a teacher's professional identity, and therefore warrants further exploration by the educational community" (p. 863).

Berkman and Plutzer (2012) found that 14-21% of science educators are endorsing the validity of Intelligent Design or creation science. Twenty-eight percent of biology teachers follow the recommendations of the National Research Council, supporting evolutionary theory, while at the opposite end are 13% who actively spend at least one hour of class time presenting creationism or intelligent design in a positive manner (Berkman & Plutzer, 2011).

Other than promoting their particular view, creationists and evolutionists both may practice avoidance because of social and community pressures. There is a concern from mainstream science that the percentage of biology teachers is as large as it is and so many promote views they consider to run counter to currently accepted biological concepts. The primary reason for this advocacy can find its root in religious foundations and justification by creation proponents is often well thought out and articulated. Long (2012), while acknowledging the inner convictions of creation-believing biology teachers, said, "Creationists, who rightly or wrongly see themselves as marginalized, are no less part of society, and are not forbidden from taking part in science" (p. 137).

Rice and Kaya (2012) wrote, "Exploring teachers' views on evolution is particularly pertinent, given that teachers' acceptance or rejection of evolution is highly likely to influence their instructional practices related to this topic" (p. 168). Although who is teaching what and the reasons they are doing so are becoming more clear, little is still known of the experiences creation-believing teachers face.

Summary

Extensive research has been conducted among students and teachers in elementary, high school and higher education institutions regarding their acceptance or rejection of biological evolution. Categories of belief involving natural and supernatural means have provided greater understanding of the complexities that have been rationalized for personal origin theories. Surrounding the varying subtleties lie the two extremes of naturalistic evolution or divine creation. While most of the literature is grounded in statistics, understanding the belief systems, and the evolutionists' struggles, little is said for the experiences of biology teachers who believe in a literal young earth creation. White (2009) asked a profound question, "How are teachers navigating their own religious beliefs as they choose and implement curriculum?" (p.864). In response to her question, the literature is silent. Mostly quantitative data are available as to the number of teachers holding to the various origins theories.

For the greater understanding of what makes teachers more effective in their teaching practices and to understand Genesis-believing public school biology teachers, deeper investigation needs to take place into the beliefs of creationist teachers and the experiences they encounter as a result. Further understanding of this phenomenon is warranted. This transcendental phenomenological study seeks to describe what it means to experience the day-to-day life of being a public school biology teacher who believes in a literal account of Genesis.

CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this transcendental phenomenological investigation was to understand the experiences of public school Christian biology teachers who believe in a literal six day, 24-hour period of the Genesis account of creation during the past 10,000 years. I have bracketed myself out of the data collection and analysis in order to reveal an authentic narrative about how biology teachers who believe in the Genesis creation reconcile their faith to a job that may contradict with their worldview. Both the internal reasoning and external struggles of participants have been investigated throughout the study.

Design

Qualitative methodologies do not focus on establishing causative or comparative understanding, but rather seek to find meaning of the human experience. Therefore, in order to fully explore the research questions, a qualitative methodology using a phenomenological approach was used in this study. Denzin and Lincoln (2005) describe an interpretive approach of phenomena as popularized by Clifford Geertz (1973). Geertz noted that modern qualitative methods have developed into a more open-ended perspective that calls for "thick descriptions of particular events, rituals, and customs" (Denzin & Lincoln, 2005, p. 17). In the present study, an in-depth analysis of the research participants' reflections has provided a deeper understanding of what it means to be a public school biology teacher who believes in the literal Genesis account of creation.

Accordingly, a phenomenological research design has been used in understanding the experiences, decision making, and actions of Genesis-believing teachers. Creswell (2007) observed similarities in the philosophical assumptions of qualitative researchers such as Van

Manen (1990) and Moustakas (1994) regarding phenomenological research. Creswell (2007) synthesized their stances by stating phenomenological research is "the study of the lived experiences of persons, the view that these experiences are conscious ones…and the development of descriptions of the essences of these experiences, not explanations or analysis" (p.58). This study met the phenomenological criteria because each participant has lived the experience, is aware of their unique experience, and has been able to describe their experience. Two general questions as posed by Moustakas (1994) guided this study: "What have you experienced in terms of the phenomenon?" and "What contexts or situations have typically influenced or affected your experiences of the phenomenon?" (Creswell, 2007, p. 61). These questions align with the purpose of the study and the central question, "What are the experiences of Christian public school biology teachers who believe in a literal understanding of the book of Genesis?" and thus reinforce phenomenology as the appropriate design.

This study used a transcendental approach (Moustakas, 1994); although I approached the study participants as an insider, I believe that taking my experiences out of the study provided more credible results. Moustakas (1994) used the term *epoche*, meaning to "refrain from judgment" when describing the researcher's role in transcendental phenomenology. Epoche requires the researcher to set aside self-beliefs and prejudging of either the participants or results of the study. Assumptions cannot be made, but rather participants' experiences are synthesized and interpreted in a fresh way.

Although I have experienced being a Christian in a public elementary school, I have not been able to assume I understand what it is like to teach in a public high school or that I have a grasp on the pressures and individual struggles each of my participants have. By bracketing myself out of the participants' experiences and maintaining the role of a descriptive researcher, I

have increased objectivity to describe what it is like to be a Genesis-believing Christian public school biology teacher.

The bracketing process or epoche is a mental decision in which the qualitative researcher needs to be continually aware. Moustakas (1994) described epoche as opening up oneself to new ideas. It is a humbling process that allows the researcher to acknowledge and admit preconceived ideas and to make the conscientious effort to set those aside in order to gain a clearer, more unbiased picture of the experience being studied. Although challenging, a better understanding and more accurate description has resulted. I have intended to approach the interaction with my participants without comparing their situation to my own or making judgments about how I would handle or resolve a situation which they have experienced. I have followed my plan on allowing the "phenomenon or experience to be just what it is and come to know it as it presents itself" (Moustakas, 1994, p. 86).

Research Questions

The following research questions have guided the study.

Central Question

What are the experiences of Christian public school biology teachers who believe in a literal understanding of the book of Genesis?

Sub Questions

1. What are teacher's self-perceptions in terms of being a Genesis literalist in the public school system?
2. What external conflicts have arisen as a result of the teacher's beliefs and practices?
3. What internal conflicts and struggles have arisen as a result of the teacher's beliefs and experiences?

4. How has the teacher responded to internal and external conflicts in terms of changing their behavior or practices?
5. How does the teacher navigate their beliefs and faith in light of conflicts?

Participants

Participants were selected through purposeful sampling. Beginning with the local school district in closest proximity, potential participants were sought out and administered a screening questionnaire (see Appendix B) to identify willing biology teachers who met the study criteria. The snowball method (Patton, 2002), which relies upon recommendations from key participants for additional potential participants, was used, but only resulted in one additional participant. Creswell (2007) supported Polkinghorne's (1989) suggestion of 5-25 individuals for a transcendental phenomenological study. Therefore, although 15 was the targeted goal, 11 participants were selected, because thematic saturation was reached—which is the concept that no more unique information can be added.

The research participants met the criteria of being a public school Christian biology teacher who believed in the literal Genesis account of creation, defined as the universe and all life being created in six, 24-hour days within the past 10,000 years. In order for the study to exhibit a high degree of transferability, sampling procedures were purposeful in order to obtain the greatest variety of educators within the established parameters. Patton (2002) described the strength of purposeful sampling as it applies to qualitative research. He suggested the researcher seek out cases that are rich in information that will provide significant insight into the study. Therefore, I used the maximum variation strategy which "aims at capturing and describing the central themes that cut across a great deal of variation" (Patton, 2002, p. 234).

The teachers must have been teaching biology for at least one year, have a valid teaching license, and be or have been certified in the content area of biology. Participants were selected from multiple states and included both men and women with different ethnicities and ages represented. A conscious effort was made to select participants from both urban, suburban, and rural schools. Although different denominations were represented and reported, church affiliation was not considered when screening participants.

Table 1

Participant Demographics

Participant	State	Years Teaching	Demographics	Teaching Status	Race	Church
Molly	WV	15	Rural	Active	White	Ch. Christ
James	WV	1	Small town	Active	White	Baptist
Enid	CA	15	Urban	Active	Afr-Am.	Ch. of Christ
John	FL	28	Suburban	Retired	White	Christian
Peggy	NE	15	Small town	Active	White	Evan. Free
Shawn	SC	15	Small town	Active	White	Ch. of Christ
Becky	AR	4	Rural	Active	White	Ch. of Christ
Hannah	KY	12	Suburban	Active	White	Baptist
Darin	CA	3	Rural	Active	White	Christian
Lona	WV	17	Rural	Active	White	Ch. of Christ
Leonard	MD	39	Small town	Retired	White	Ch. of Christ

Setting

The setting for this study was American public high school biology classrooms. In this era of high stakes testing, science objectives are moving toward a more unified standard; however, differences in state standards still exist. In light of those differences a variety of schools were selected so as to not overrepresent any one state or district. Face-to-face interviews, Skype, FaceTime and phone conversations were used for the interviews.

Procedures

After securing IRB approval (see Appendix C), potential participants were solicited, beginning with those locally in eastern North Carolina. Initial email addresses were acquired through word of mouth for those expressing interest in the study or through web searches and sending emails to various churches, schools, and apologetics organizations. Once a potential participant expressed interest, the screening questionnaire and consent form were sent to be filled out and returned.

After acceptance by teachers to join the study, they were interviewed (Moustakas, 1994) from whatever setting they felt most comfortable. Some were interviewed (n = 2) face-to-face and some over the phone (n = 2), while most participated in a video interview from their home (n = 6). A single participant (n = 1) transcribed his own responses to the questions. In addition, reflective journaling questions were given to participants for them to think through and return within 30 days of the interview.

In order to protect participant identity, pseudonyms were assigned. Most transcripts were completed within one week of the interview. Recommendations and contact information for others who might have been interested in participating in the study was requested, as it aligned with the snowballing model, but this did not result in many additional participants.

After transcribing personal interviews and focus groups and analyzing journaling responses, coding revealed emerging themes. The Science Teaching Efficacy Belief Instrument was also administered at the conclusion of the interview as well as the reflective journaling portion.

The Researcher's Role

As the human instrument that collected and analyzed the data, I bracketed my own beliefs and experiences from the data analysis, as suggested by Moustakas (1994), and was as neutral as possible when evaluating participants' experiences. Having taught biology in the past from a creationist perspective in a private school and general science in a public elementary school, I am familiar with both science contents and some of the conflict on origins a teacher might face. Regardless of how I would react to the same situations, I wanted to understand the overall experience of today's public school biology teachers.

This study explored whether participants had experienced some degree of stress or cognitive dissonance as a result of their faith and teaching assignment. I was aware of the potential that this may be external, but more likely there were internal dilemmas which participants either have already gone through or were in the process of reasoning out. As I analyzed the data I looked for feelings of external oppression, the sense of being in a cultural war, and the internal reasoning that participants went through.

Data Collection

In order to achieve data triangulation, a variety of collection and analysis methods was used. After eligibility was established by the initial questionnaire, participants were interviewed. Following the interview, participants were provided with journal scenarios to which they responded in order to gather more reflective data. In order to measure participant self-perceptions, the Science Teaching Efficacy Belief Instrument (STEBI) was administered (see Appendix D). After all interviews were conducted, a focus group was established with local participants in order to gather data through group interaction.

Questionnaire

A questionnaire (see Appendix E) was used to collect demographic information and to ensure the biology teachers were self-professing Christians who believed God created the world within the past 10,000 years in six literal, 24-hour days. The demographics were also evaluated in order to assist with the purposeful sampling technique in order to ensure maximum variability. Questionnaires were administered through email to potential participants through my current local connections with churches and public school employees. Prior to administering the research instruments to potential study participants, all of the instruments were piloted with two biology teachers who met the study criteria. Based on their feedback the interview questions were revised in order to improve the instrument.

Interviews

Interviews were conducted in order to gather the majority of data and to identify significant themes and similarities (Moustakas, 1994). Two participants were interviewed face-to-face and the rest were conducted through a phone or computer. Depending on participant familiarity, technology modes of interviews were either through Google Hangouts, Skype, or phone conversations. Participants were always allowed to choose the location and method in which they felt the most comfortable. Some may not have wanted to divulge their practices and beliefs in a semi-public setting such as an after-hours classroom, so they may have chosen to use distance technology from their home. Interview questions can also be found in Appendix F.

Table 2

Interview Questions

1	Why did you become a teacher?
2	What made you decide to teach in a public school?
3	How would you describe your views on the creation of the universe including humans?
4	What are your personal feelings of the creation account from the book of Genesis?
5	As a public school science teacher who believes the book of Genesis, what have you experienced that has impacted your teaching practice in regards to origins?
6	Who or what has had an impact on your beliefs as a teacher who believes in the Genesis account of creation?
7	How do you handle conflicts between what you believe and what you are required to teach?
8	How do you respond to student questions that are in conflict with your beliefs about creation?
9	Which regulations or laws are in place that you know of which limit your ability to teach science based on your beliefs?
10	Have any individuals or organizations ever caused you to feel that you needed to either suppress or teach a lesson with which you were not comfortable?
11	Do your personal beliefs affect your relationship with your colleagues with the school?
12	What conversations have you had about your beliefs with students, parents, or colleagues outside of school hours?
13	Have you ever attempted to cast doubt on evolution or promote creationism? Please explain.

The interview questions were designed to explore experiences that were absent in evolutionary supported literature. Recent quantitative studies from both educational and science literature are based on simply identifying the number of teachers who teach based on a non-naturalistic view without a deeper look at their rationale. The first two questions were intended

to help participants be more comfortable with the interview process and begin reflecting upon their past and the reasons decisions were made up to this point in their life.

Questions 3 and 4 were designed to allow participants to express their beliefs. It was necessary to look for belief in terms of knowledge rather than feelings (Patton, 2002) in order to illicit a deeper response than was provided on the questionnaire. Ensuring the beliefs of participants were homogenous in regards to origins theory ensured that all participants were indeed part of a unique group.

After backgrounds and beliefs were established, questions 5 and 6 sought to find out the experiences that have occurred as a result of beliefs. By this point a comfortable dialogue had been developed and the questions moved on to understand the experiences (Denzin & Lincoln, 2005). It was necessary to know if the participants believed any external person or action had impacted their beliefs and teaching. These are broad questions that were narrowed in focus in subsequent questions.

With beliefs and experiences addressed, the questions then turned to seeking a description of any conflicts that may have occurred. Questions 7-12 dealt with how any conflict had been handled by the participants. Questions 11 and 12 were specifically designed to find out about the perceived relationship with others.

Question 13 was meant to reveal to what extent participants were willing to go to promote their personally held beliefs. Prior to the interview there was a question as to whether participants would adopt a "hunker down" or "promoting a cause" mentality. The literature alluded that the teachers may believe it is up to them to defend their beliefs or promote a cause (Berkman & Plutzer, 2010), but to what degree was unknown until this current study was conducted.

Self-Efficacy Survey

The Science Teaching Efficacy Belief Instrument (STEBI) was used in order to provide further insight into a teacher's view of science teaching self-perception. This instrument was developed by Riggs and Enoch (1990). Their intent was to increase science literacy and explore factors that impacted pre-service science teachers' self-efficacy. The Science Teaching Efficacy Belief Instrument has a credibility coefficient of 8.5 (Gercek, Yilmaz, Koseoglu, & Soran, 2006). Numerous studies have used the scale in subsequent research. The STEBI aided this study by providing an additional reference point on which to ground the findings and around which to further the discussion.

Understanding teachers' self-perception is critical to understanding how they deal and cope with stressful situations in their lives. Conflicts may arise if a teacher's personal faith contradicts their teaching responsibilities which could impact their degree of self-efficacy. The Science Teaching Efficacy Belief Instrument (STEBI) was used to gain insight into the self-efficacy of participants.

Focus Groups

> Data were also attained by creating a focus group through the interaction of participants. Participants need not agree with each other or reach any kind of consensus. Nor is it necessary for people to disagree. The object is to get high-quality data in a social context where people can consider their own views in the context of the views of others. (Patton, 2002, p. 386)

Participants joined and were allowed to freely interact with each other and were also provided prompts for further discussion (see Appendix G). Transcripts of all discussions were analyzed for additional insights.

The focus group was made up of three participants and met through Google Hangouts in order to allow participant discussion of content and curriculum-related issues. I served as moderator in order to facilitate the discussion (Patton, 2002). A discussion took place on local and state curriculum issues that were impacting the participants. National standards were also discussed, specifically those dealing with evolutionary biology. Discussions and questions also explored the nature of creation science and misconceptions the participants felt the public and scientific community had.

Journal Responses

A critical piece of information was obtained by providing teachers written scenarios and journaling opportunities. These were to contemplate selected topics and provide a response within 30 days of the initial interview. Topics were sent to participants and returned through email (see Appendix H). Creswell (2007) described how written forms of data collection, in addition to interviewing, can add further descriptive insight into the studied phenomenon. Throughout the interview trust was built, but deeper thought occurred after the interview upon reflection. The purpose was to know how the participants would feel or act in given situations.

Data Analysis

Moustakas' (1994) data analysis suggestions was utilized for this study. For example, organizing a full description of my experiences was a valuable strategy for bracketing out my experiences. Transcripts from the interviews, as well as the written scenarios were analyzed by coding and thematic organization. It was necessary to go through each statement verbatim and to begin clustering words, thoughts, and phrases into themes (Moustakas, 1994). Prior to compiling a final synthesis themes were categorized based on both the internal and external experiences of the participants.

The data gathered from the STEBI were qualified in a descriptive format. The primary purpose of administering the STSEBI was to see if there was an overall trend of resiliency among biology teachers who believed in creation and how developing one's beliefs from the minority perspective may influence one's self-efficacy.

Classifying

Each interview was transcribed for analysis. Every transcription was analyzed in order to develop a list of significant statements (Creswell, 2007) (see Appendix I). Statements were reviewed for commonality and then grouped or clustered together. Care was taken to avoid repetitive and overlapping statements (Moustakas, 1994).

Interpreting

Based on the clustered data, the meanings were synthesized and a textural description was constructed. The description brought to light what has happened with the phenomenon (Creswell, 2007), which for the purpose of this study was what the participants have experienced as a result of being public school biology teachers who believed in Genesis. Moustakas' (1994) suggestion that verbatim examples be included was followed.

After an explanation of what had happened, a structural description was created which is an explanation of how the phenomenon occurred. The emphasis of structural descriptions is on setting and context (Creswell, 2007). Belief and action were explored to see how they intersected in the public school environment and the internal and external impact the experiences have had on the participants.

Representation

Following identification of the emergent themes and building a textural-structural description, a descriptive narrative was developed in order to summarize the findings with

clarity. This will allow future readers to better understand the experiences of Christian public school biology teachers who believed in a literal understanding of the book of Genesis. This composite description (Moustakas, 1994) consisted of the synthesized interviews and journaling of all the research participants in order to identify the essence of their common experience.

Trustworthiness

It is necessary to establish trustworthiness in any qualitative study. The traditionally quantitative design of past scientific studies emphasized the objective nature of research (Patton, 2002). In order to minimize doubts about qualitative research, the investigator should establish safeguards so that the outside observer will be able to recognize the study as being both valid and reliable. Validation is "an attempt to assess the accuracy of the findings, as best described by the researcher and the participants" (Creswell, 2007, p. 206). To meet this need Lincoln and Guba (1985) established criteria of credibility, transferability, dependability, and confirmability.

A study is considered credible if it indeed measures and reports upon what it claims. Extensive time was put into working with participants in the form of interviews. It was not necessary to request multiple interviews in order to accurately represent the participants' experiences. In order to verify credibility the participants of the study were asked to check the transcripts for accuracy as well as the synthesized analysis. Although they were allowed to respond to their interview, only one participant chose to do so.

Dependability for this study was acknowledged by the parameters and context in which the study occurred. This research was not being done in one particular setting but rather in the reflective memories of participants who teach in public schools. An acknowledgement was made that participants were each in a unique situation with differing backgrounds. Members of the study may have experienced individual issues on the day of the interview that detracted from

the study such as fatigue, hunger, or an emotionally trying day, but the impact among participants was expected to be minimal.

To ensure a high degree of transferability, an attempt was made not to over represent any single demographic. A thick, rich description of methods, participant demographics, and findings was used to increase transferability. Different states, urban, suburban, and rural locations, length of teaching, racial and ethnic background, and gender were all considered. According to Patton (2002), the aim of maximum variation is to describe the results from an unvaried large sample with the belief that if the same themes emerge from diverse participants this would truly capture the essence of the experience.

Confirmability for this study was possible because accurate records were kept in order to verify the information contained within the study and the descriptions that were revealed are represented accurately. The records include participant transcripts, journals, and any notes made throughout the study. This study followed the suggestions of Lincoln and Guba (1985) of an audit trail being left so that, if necessary, an audit could be completed (Patton, 2002).

Research questions are grounded in a theoretical framework and this study dealing with biology teachers who believe in Genesis creation is guided by the principle of resting upon a theoretical framework. The work of both Bandura (1977) and Schoenfeld (1998) ensured the study was based on a solid foundation of theoretical and empirical thought. This study built upon literature from psychology, biology, and religion in order to better understand the Genesis believing biology teacher.

Ethical Considerations

This study was conducted with the highest ethical standards. Anonymity was guaranteed for all participants. Teachers were made to feel confident that divulging their experiences would

not result in punitive consequences. Both participant names and school districts have been kept confidential and pseudonyms have been used. Records have been kept secure. Digital data were kept on a password protected computer and any paper notes or transcripts are kept in a secure and locked cabinet.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this study was to identify the experiences of public high school biology teachers who believe in a literal understanding of Genesis creation. Participants of this study must have taught or currently be teaching high school biology in a public school classroom and believe the Genesis account of creation occurred in six literal, 24-hour days within the past 10,000 years. Through interviews, journaling questions, a focus group, and an efficacy survey data were collected from each participant. Themes were generated that included: confidence in their belief system and science teaching ability, non-avoidance of evolution, casting doubt on evolution, subtlety in promoting creation, tension between colleagues, a feeling of community support, fostering student relationships, sharing beliefs outside of school, and only a vague understanding of the legality of promoting creation.

Participants

Eleven participants were selected through contacting churches, public school Listservs, and through various Christian Apologetics organizations. While there was an attempt to use the snowball method to gather participants, there was only one recommendation that provided an additional person. Two retired teaches served to pilot the research instruments. The purpose of the piloting was to guarantee the questions were understandable and communicated clearly. The pilot results were not included in the study because the answers that were later based on the revised questions would not have been consistent with the original piloted questions and responses. Participants included five males and six females. Eight states representing the geographic regions of the west, south, mid-west, and mid-Atlantic were represented. Years of experience ranged from one to 39, with two of those participants now being retired. Religious

affiliation included those who identified with evangelical churches including Baptist, Independent, Church of Christ, and some who self-identified as Christian.

Molly

Molly was a teacher from West Virginia and had taught for 15 years. Four of those years had been as a biology teacher; however, her current teaching assignment was that of chemistry and physics. She taught in a small rural high school with a predominantly White student population. Molly was a member of the Church of Christ. She said, "I knew from an early age I loved school and I loved learning and I wanted to be a teacher."

James

James was a teacher from West Virginia and had one year of teaching experience. He taught in one of the largest high schools in the state which was predominantly White with a few African-American students. James was a member of the Baptist church. James shared that his football coach who taught biology had a big impact on his life. He reflected,

> I just saw him as a man that could make a difference in people's lives and could encourage them and let them achieve more than they thought they could. I saw God leading me in that direction as a young man.

Enid

Enid was a teacher from California and was the only African-American participant. She taught in a large school that was ethnically diverse and was made up of Latino, Hmong, African-American, and White students. Enid had taught 15 years and was a member of the Church of Christ. She became interested in science during high school and was influenced by her mother and grandfather who were both teachers.

John

John was a retired teacher from the state of Florida. Before retirement he taught for 28 years. He taught in the suburb of a major city which was made up of 60% White students and 40% minority students. John identified as Christian. John was not a Christian at the time he initially decided to become a teacher and made his decision to enter the profession because of a desire to coach cross country and track.

Peggy

Peggy had worked for 15 years in the Nebraska school system. The students were predominantly White with very little ethnic diversity. Her school was in a small town surrounded by a farming community. Peggy's religious affiliation was Evangelical Free. She became a teacher after working with children on mission trips, volunteering, and summer camps and believed her interests of science, math, and logic would blend well with her interest in helping children.

Shawn

Shawn taught in a South Carolina high school. He had 15 years of experience and was also certified to teach gifted and talented students. He taught in a school that was 53% White with 60% of the students being eligible for free and reduced lunch. He was a member of the Church of Christ. Shawn had always wanted to be a teacher.

Becky

Becky taught in a public school in Arkansas. Prior to her current assignment she taught at a community college. She taught in a small school of about 200 students in grades 7-12. Her student population was primarily White. Becky was a member of the Church of Christ. Becky

taught high school biology after working for several years in a health facility as a microbiologist and then as a science teacher at a community college

Hannah

Hannah had worked in Kentucky throughout her 12 year career. She taught in a large, suburban school with approximately 3,500 students. Only about 20% of her students qualified for free or reduced lunch. Heather was a member of the Baptist church. Hannah became a teacher after working with youth and teaching wilderness survival skills. She enjoyed the sciences and the education process and decided to go back to school to get a teaching degree.

Darin

Darin taught for three years in the state of California. He saw growth in his district with the dynamics going from a rural to an urban area. The student population was mostly White and Hispanic. Darin identified himself as a Christian. He said he became a teacher because, "I was told that I was easy going and I was able to convey ideas and read people and I really enjoy to see that I am helping someone."

Lona

Lona taught in West Virginia for 17 years. She taught in a small rural school made up of primarily White students. About 50% of the students in her school were considered economically disadvantaged. Lona was a member of the Church of Christ. She became a teacher because it was compatible with her desire to have a family. She loved studying human anatomy and physiology while in college and decided to major in biology education.

Leonard

Leonard was a retired teacher, having taught for 39 years in both Maryland and West Virginia. He taught in a school that was made up of 99% White students. He believed his

community was made up of Bible believers. Leonard was a member of the Church of Christ. He said he became a teacher, "because that's what my track coach did. I wanted to follow in his footsteps and once I got to college I realized science and physical education required some of the same classes…so that's why I ended up in teaching."

Results

High school biology teachers who believe in Genesis creation have similar experiences to one another. The way in which these teachers identified themselves, their interaction with students and colleagues, and how they adjusted their instruction based on their belief system is one of thoughtful, personal introspection. This thorough cognitive process is in harmony with Schoenfeld's (1998) teaching in context theory, where he examined the relationship between a teacher's knowledge, goals, and beliefs. As a result of the data collected throughout this study, clearly defined themes emerged. The themes that emerged were: a love for science, a strong belief in Genesis creation, a high self-efficacy towards biology teaching ability, the willingness to teach what evolution is, the intent to discount evolution, tension from outside sources, the feeling of strong community support, the belief of strong student relationships, and only a vague understanding of the current legal status of the creation/evolution debate.

Participants were informed through the consent form (see Appendix J) and prior to the interview of the purpose of the study. The intent of the study was to answer the following research question. What are the experiences of Christian public school biology teachers who believe in a literal understanding of the creation account as recorded in the book of Genesis? The following sub-questions guided the research instruments.

1. How do the teachers perceive themselves in terms of being a Genesis literalist in the public school system?

2. What external conflicts have arisen as a result of the teacher's beliefs and practices?
3. What internal conflicts and struggles have arisen as a result of the teacher's beliefs and experiences?
4. How have the teachers responded to internal or external conflicts in terms of changing their behavior or practices?
5. How does the teacher navigate his or her beliefs and practices in light of conflicts and evolutionary expectations?

Research Question 1

In regards to the research question, "How do the teachers perceive themselves in terms of being a Genesis literalist in the public school system?" the following themes emerged: entering teaching as a result of a love for science, having a strong belief in Genesis creation, and self-efficacy towards biology teaching ability.

Love for Science

Each Genesis-believing participant in the study noted that he or she became a biology teacher because of their love for science which began during their youth. No participant expressed a pre-planned agenda to become a teacher in order to promote a creationist viewpoint, but as a desire to teach science and promote a love of discovery and exploration for the next generation. For example, a study participant from Nebraska said,

> I had done a lot of mission trips, volunteering, summer camps where I was working with high school kids a lot and just loved it, so becoming a math/science teacher was a good blend for me bringing together my love for science, math, and logic and my love for working with kids.

Some participants were influenced by a coach or a past teacher and many spoke favorably of a past mentor-type relationship. James said, "I guess I went into science and physical education, because I really wanted to coach…I guess I just wanted to follow in his footsteps." Another said, "One of my biology teachers himself, I don't know his views, but he really got me interested in biology and the cell and it just amazed me."

Several participants combined a personal influence with their faith in their early decisions to become a teacher. James also said,

> It's a desire and calling from God. I had a great role model in my grandmother who was a teacher for years and also just great experiences within schools. My football coach taught biology and had a huge impact on my life and I just saw him as a man that could make a difference in people's lives and could encourage them and let them achieve more than they thought they could and I saw God leading me in that direction as a young man.

Shawn was an active member of his church during his high school years. He said he had a chemistry teacher who was talking about God and experienced a moment realizing that science did not contradict the Bible and he could merge the two great interests of his life.

When asked about the decision to become a public school teacher, most (n=10) said they either did not consider going to a private school or there was not a private school in the area. They all shared a sense that they wanted to teach science and began working at the first school that hired them. They did not specifically seek out a public school in order to proselytize their faith but to teach biology at the high school level.

Strong Belief

The six days in Genesis 1 are believed to have occurred in literal days composed of 24 hours. Participants believed the conclusion can be drawn that the earth is less than 10,000 years

old based upon the genealogies and information recorded in the Bible about the lifespan of early man. All the participants in the study expressed a strong, well-articulated belief that the Bible is the inerrant word of God. They believed the creation account in the book of Genesis is meant to be taken literally.

Participants in the study were confident and stated similar convictions. Words such as "designer" and "creator" were used to describe God. Beliefs were expressed in the following manner: "I believe in the literal sense of creation as it is written in the Bible," "God spoke it into being," "I believe in the literal 6 day creation. That pretty much says it," "I believe exactly as it says in Genesis chapter one and Genesis chapter two," and "My view is the Bible is 100% literal, that it is 100% accurate the word of God and God created the universe exactly as described in Genesis." When Hannah was asked by a student if she was a Christian she responded, "Yeah, I am. I absolutely am."

High Self-Efficacy in Biology Teaching Ability

The study participants also voiced confidence in their personal teaching skills. The Science Teaching Efficacy Belief Instrument (STEBI) was given in order to gain insight into how the participants viewed their own knowledge and teaching ability. A qualitative review searched for patterns. Answers on the STEBI varied from Strongly Agree to Strongly Disagree. As evidenced by the full scale average, all participants viewed themselves in a positive light when it comes to teaching ability (see Table 3).

Participants generally believed strongly in their ability to teach science effectively and viewed themselves as understanding the scientific process. Questions in which participants scored higher were affirmations of their ability to teach and convey scientific concepts.

Statements in which they disagreed were suggestions that they were not able to motivate students or lacked critical skills.

Table 3

STEBI Scale Answers

Statements Where a High Score Indicates High Efficacy										
Statement	Molly	James	Enid	John	Peggy	Shawn	Hannah	Darin	Lona	Leonard
[redacted]	4	4	4	5	5	4	5	3	4	5
[redacted]	5	4	5	5	5	5	5	5	5	5
[redacted]	3	3	4	5	4	4	4	3	4	5
[redacted]	4	5	5	5	4	5	5	4	4	4
[redacted]	4	4	4	2	2	2	4	4	4	4
[redacted]	4	4	2	4	3	4	4	3	3	2
[redacted]	3	4	3	4	4	4	5	3	4	4
[redacted]	4	2	3	4	4	4	4	4	2	4

[redacted]	4	2	4	2	4	4	4	3	2	4
[redacted]	3	4	3	5	4	3	5	4	2	4
[redacted]	5	5	4	5	5	5	5	5	4	5
[redacted]	5	4	4	5	4	5	5	4	4	4
Average	4	3.75	3.75	4.25	4	4.1	4.6	3.75	3.5	4.1

Statements Where a High Score Indicates High Self-Efficacy

Statement	Molly	James	Enid	John	Peggy	Shawn	Hannah	Darin	Lona	Leonard
[redacted]	1	2	1	2	2	1	1	4	2	2
[redacted]	3	3	2	2	2	4	2	3	2	3
[redacted]	1	2	1	2	2	1	1	2	1	1
[redacted]	2	2	2	2	2	1	1	2	2	2
[redacted]	4	2	1	2	2	2	1	2	2	1

[redacted]	4	4	1	4	2	4	1	3	4	2
[redacted]	1	2	2	2	1	2	1	2	2	1
[redacted]	1	1	2	1	1	1	1	3	2	2
Average	2.1	2.25	1.5	2.1	1.75	2.0	1.1	2.6	2.1	1.75

Research Question 2

In regards to the research question, "What external conflicts have arisen as a result of the teacher's beliefs and practices?" the following themes emerged: (a) similarity in sources of tension, (b) a strong feeling of community support, and (c) the importance of student relationships.

Sources of Tension

The primary source of tension among participants was disagreements with other science teachers within the school regarding origin theories and what should be taught, though the degree to which they felt tension differed. One participant went so far as to say a colleague of hers did not feel anyone could be a real biology teacher and believe in creation.

No participant ever had a conflict with an administrator, and many administrators applauded their treatment of the standards. Shawn said the following about his school culture: "The principal says a prayer before faculty meetings. We have prayers before football games. The big district meeting at the beginning of the year, the guy in charge of the district says a prayer." Becky said that when she was interviewed she told the administrator,

> I'm from a Christian school. This is what I believe. I'm not going to back down from that. I will teach evolution as a theory, but I'm not going to say that it's the truth and I'm not going to say that it is scientifically proven. She said he was supportive and responded to her by saying, "If you err in that you need to err on the side of Christians because this is a Christian community and we would all support you in that."

Participants also did not experience any hostility from students or parents. When most parents found out that evolution would be covered in an upcoming lesson, parents would often make contact to state their displeasure. Parents were pleasantly surprised when they found out their child's teacher believed in Genesis creation.

Community Support

Most participants felt strong community support. They cited being in a small town or rural area. Peggy said,

> I don't have influences here that people on the coast are getting. Some of the more liberal types of thinking. It's definitely infiltrated here, but not to the extent the other parts of the country have. We're still a bunch of farmers out here.

During the focus group conversation, Shawn agreed with Peggy in that he lived in a rural area and that contributed to the general acceptance of what he taught and believed. The lone exception was the teacher from California. Although Darin had not experienced any overt hostility, he was aware of the community dynamics to an extent that he was not as comfortable promoting his beliefs as he was simply casting doubt on evolutionary theory.

Interestingly, every teacher who felt they had community support felt they were in a unique position. Two teachers claimed they were the exception rather than the rule. Only two teachers were aware of others who currently taught biology in a public school who believed as

they did. It appears that there is more reliance on the local community for support than on any network of creation-believing teachers. Molly said,

> I've been very lucky because I've always taught in really small country schools or really small communities like this where people are still pretty conservative and I feel free to tell kids my opinion if they ask me and I've never had any backlash from that whatsoever. So if they ask me what I believe I tell them. I've never got in any trouble so far.

Student Relationships

All participants claimed to have a good relationship with students and worked to build rapport. Participants mentioned that students are encouraged to ask questions and dialogue with the teacher and other students. Participants were inclined to use a discussion format during evolutionary chapters. Hannah said in regards to evolutionary ideas that she "allowed them to voice opinions." She appeared to take a gentle correction tactic with opposition. One example she provided was that she said, "Certainly not knocking that down at all, but helping them understand there is phenomenon that can happen that caused different dating of fossils and earth's landforms and things like that."

Becky was concerned with student perception and said, "I don't want to come across to my students that I'm skipping over this because I just don't agree with that. I think that we need to take it head on." Participants do indeed take the issue head on and do not feel pressured, challenged, or defensive when it comes to student interaction. Molly tells her students,

> You're free to disagree. You're free to grow up and change this. You're free to find more facts. You're free to research this on your own. You're free to believe whatever you want…. I don't feel the least bit threatened.

Participants believe there is a mutual respect between teachers and students and there appears to be a relationship between teachers and students to the extent that the student can pick up on clues about the teacher's intentions. Shawn indicated this relationship in an example he gave during a lesson. He said,

> When I teach earth science we talk about earth's magnetism and earth's magnetic field and I often say the magnetic field was designed to protect us. And I will say it 5 or 6 times. Every single time, it never fails, a student will say, "Mr. T. why do you keep saying it was designed?" and then another student will go, "Because that's the way God designed it."

Research Question 3

In regards to research question 3, "What internal conflicts and struggles have arisen as a result of the teacher's beliefs and experiences?" the following themes emerged: internal rationalizing and justification as to how much time to give evolution.

Internal Rationalization

A source of tension, especially among the younger teachers, was exactly how much of their own beliefs to include alongside the evolutionary lessons. No teacher wrestled internally with their own personal faith and none had a problem casting doubt on evolutionary theory, but some would go to greater lengths than others in verbally explaining the Genesis model. There was an awareness of what they had heard on the state or national level and they did not want to become like "that teacher" that kept them pondering how much restraint they should show in promoting their faith. Darin said in relation to his teaching, "If it doesn't hit the standards someone's going to come into your classroom and start asking you, 'Well what are you doing?' I don't want to be that guy on the news." A constant internal wrestling with exactly how close to

the "line" they could get or how far they could step over without being reprimanded is evident. Becky said, "You know you have to walk the line because it's like the squeaky wheel gets the grief."

Research Question 4

In regards to research question 4, "How have the teachers responded to internal or external conflicts?" the following theme emerged: professional relationships can become tense but are maintained.

Professional Relationships

The conflict with fellow teachers was the most cited source of tension, and although serious disagreements arose, all maintained a professional relationship with their colleagues and some are close friends with their evolutionary believing peers. All participants were willing to continue to dialogue with their peers and it is with this group they are most willing to bluntly debate or attempt to convince that Genesis creation is true. Molly used a questioning technique and said,

> Most science teachers even if they are religious, they still believe most geology or biology theories. Most are kind of theistic evolutionists and they'll want to try and mesh the two and so we've had some discussions and I just bring up some things, ask some questions that might cause them to think [such as] how do you, if you really believe the universe was this old, how do you explain things? Short term comets? Just ask them things to kind of make them think.

James said,

> There is conflict at times. There's a younger teacher. He's a huge fan of Darwin and a huge fan of Stephen Hawking and he's as far to the direction that science is supreme as I

> am that God is supreme and there has been conflict. God's allowed me the opportunity to be there and to be able to share my faith…I'm looking at it based on what the Bible says. That's why I believe. This is what you believe and that's fine. I'm O.K. and you're O.K. That's the only sharp conflict I've had and we still eat lunch together every day. It's still congenial. He even wanted me to go to the football game with him last night, but on that point there's just a big difference, a big divide.

On the reflection portion of the journal prompt, in response to a young, new teacher Darin said he would,

> Help them realize that it is the teacher's job to teach students to think for themselves. With any tension that might exist in this area it doesn't rescue them of that responsibility. I would also tell them that every position has its challenges and in this one we are forced to play by their rules.

Research Question 5

In regards to the research question, "How does the teacher navigate his or her beliefs and practices in light of conflicts and evolutionary expectations?" the following themes emerged: participants were willing to teach the basics of the theory of evolution, they attempted to discount evolution, they were willing to share their beliefs, and they lacked awareness of the current legal status to promote creation.

Teach Evolution

The creation-believing teachers do not shy away from evolutionary theory. With the exception of one participant who skipped the topic altogether during his classroom instruction, all others readily embraced teaching Darwinian principles. They did so, however, out of a sense of a "this is what evolutionary theory says" type philosophy, being very factual and

straightforward. They believed that it is important to know the viewpoint of evolutionary biology for several reasons. First, it is believed that much of the dialogue in biology and future coursework rests on evolutionary thought and in order for students to navigate their own scientific understanding, a foundation, albeit one they felt is in error, is necessary for future interaction. Molly said,

> Here's what the standards say we need to cover. This is what's going to be on the West Test or the Next Generation or whatever the next test is coming up. Here's what you need to know what most scientists believe, but you're free to believe what you want.

The teachers were all acutely aware of their state standards. Although they did use the district supplied textbook, the general consensus was not to "belittle the curriculum." John said, "It was my job as a public school teacher to not favor nor discriminate against a particular belief system and to inform students to the best of my ability of the current information on a topic." This same participant referred students to the apologetics websites of Answers in Genesis and The Institute for Creation Research. The teachers were finely attuned to their requirements so as to guide students through an understanding of the information required by their state or district without causing the student to lean toward acceptance of evolution.

Investigating whether curriculum standards leaned more towards students having understanding or acceptance was discussed during the focus group. The Midwest and South Carolina participants were quick to respond that understanding evolutionary theory was all that was required by the state. They were comfortable with this minimal requirement of simply explaining what evolutionary theory said, as that could easily fit into their belief system without violating their principles. The California participant stated that between the standards and the curriculum, California leaned toward acceptance. He informed the group,

> The textbooks we use don't use that terminology (micro and macro evolution) and sadly I think our standards and the curriculum we're using are just trying to expose them to the idea, not the idea but the fact of evolution rather than try to teach them the distinctions that exist within the theory itself.

Participants also recognized a need for students to achieve well on standardized tests. Often the statement may be inserted into the lesson, "This is what they want you to know for the test, but it is not necessarily what I believe." Hannah said,

> I definitely have to teach something in which we can see change, such as we can measure change over time in evolution, but have to teach students how to sift through what may or may not be true and to have some ideas for themselves because in order for them to score on a test they have to have some information that I tell them that this isn't necessarily the way the earth began and evolution does not mean the origin of the earth; however, these are some things you need to know and some terms in order to be an intelligent being.…It's not fair to the students who care about their testing, nor is it fair to my school's test scores, nor is it really fair that it's on that test, but it is. That's how it is.

Finally, the belief among the participants was strong that if students don't "know the enemy" they will not know how to combat the perceived errors they face through either media or other future classes. Becky said she tells her students, "Look, I know how I teach and the textbooks, I think gets a lot of it right, but they get a lot of it wrong and you need to study this to find out what you think."

Discounting Evolution

With the exception of the teacher who chose to skip the evolutionary chapters, the primary thrust from participants was to inform students what biological evolution was and to cast

doubt upon its validity. All teachers believed it was vital to discount evolutionary theory in order for students to have a proper understanding of biology. They did this out of a sense of both scientific and righteous duty. For example, Peggy was adamant about what science has and has not shown. She said,

> Never in the history of the world, in observable science, has there been a jump from one species to another. I tell the story of how they have found DNA in mastodons and how they've tried to implant the egg into an elephant, hoping the female elephant would carry the mastodon. Can't get it done. Even when they're trying to go to another species you're not ending up with anything that is going to be able to regenerate another species. I would discuss those things and I would point out the flaws of evolution.

Many participants mentioned they had researched aspects of the Intelligent Design (ID) movement and regularly used this strategy to expose evolutionary flaws. For example, participants cited many of the teachings used in the ID community such as the complexity of the eye and the cell as was popularized by Behe (1996). Other traditional Christian evidences were brought into the biology classroom as well. Flood geology was mentioned as well as other types of catastrophes such as the Mount St. Helens eruption. Apparent design was a major theme among participants. Peggy in speaking of complexity and her frustrations of those in the scientific community said,

> The more we learn about the ribosomes and the mitochondria and the nucleus and the DNA and the RNA we're just like, Oh my goodness. There's no way you can explain this by Darwinian evolution. All the gradual step by step, it just doesn't hold up. But nobody's going back to the drawing board. Nobody's saying let's find a different model. They're just saying O.K. let's assume this and move on.

Several participants emphasized the word, "theory" and stressed the Theory of Evolution will never become a law. Shawn said,

> I teach it as a theory, as this is one possible explanation of how humans came to be on earth. There are multiple theories and here is one that the state of SC requires you to know. Many times I will say I have personal beliefs against this theory, and again that gets the conversation going on in my class again. But I teach it as a theory.

Creation-believing teachers also do not have a problem teaching microevolution, or changes within species. Many, in fact, spend considerable effort explaining the distinction between micro and macro evolution. Darin said,

> Because the standards are vague in one area, I'm able to teach it, the difference between micro evolution and macroevolution. I think the kids will see. They'll think, "Wow, we can actually see micro. We can see that. Why do they call it evolution?" I think they can see this macro evolution is kind of weird. Where's the evolution? It's an analogy. It looks similar. They act similar. But where's the real evidence?

The scientific method and logical reasoning was mentioned as being intentionally taught to students. The participants also used terminology that evolutionary believing biology teachers do not. Observational science was mentioned and is understood to be science which can be observed and verified. The opposite of observational science is the science that is theorized about but can never be tested because it occurred in the distant past. Observational science was often used as an example in contrast to Darwinian evolution. The term "observational science" has been used by Ken Ham and others to show the difference between science that can be seen and that which must be inferred. Ham was one of several apologists to be mentioned as being

used as resources. Other apologetic groups include Apologetics Press, Creation Ministries, Focus Press, and the Discovery Institute.

The scientific method was heavily mentioned as a tool used to discount evolution, with the teachers explaining that an experiment could never be carried out and the evidence that is normally referenced by evolutionists is all interpretive and based on faulty assumptions. Peggy mentioned that if Watson and Crik had used the same sequence and methods of putting forth a theory as Darwin had, their research would never have been accepted. She went on to say that regarding origins,

> Most of the people who believe in evolution start with the premise that there was primordial dust floating around in the universe, floating around in the cosmos and it starts spinning faster and faster and they come up with the story of the big bang. Great, let's go with that. Where'd the primordial dust come from? You know you just have to keep going back and back and back and once you get back to absolutely nothing, it just popped into existence? What popped into existence and where did it come from? When you start looking at laws of logic, when you start looking at Newton's laws of everything, laws of motion, laws of energy, laws of thermodynamics, how could anything come from absolutely nothing. And that's where people get tripped up. Nobody has an answer for that. I've even had a conversation with high school kids who said aliens put it there. So I said, "Great let's go back to the aliens. Who started them? Where did they come from? So you just keep them going in a circular reasoning until they come to the conclusion that nothing comes from nothing.

Participants claimed to have made an attempt to provide a classroom atmosphere where students did not feel belittled if they disagreed with the design or creation slant the teacher was

hinting at or directly stating. Some participants allowed modest debate, but most used discussion and did not want to come across as arguing with students who disagreed with creation. Hannah said,

> There's a big difference between a discussion and a debate. I purposefully stay away from debates with students about how the earth began. People have been debating since we have had recorded history about how the earth began. We're not going to solve anything by debate.

Participants were more likely to allow students a few moments to debate with one another in order to bring some creation thought into the discussion.

Participants encouraged students to seek out additional information. Students who disagreed were especially encouraged to continue the dialogue or debate by saying, "You go out and find the facts." "Show me the evidence" was another well used phrase. If the participant felt the topic was approaching too far into the realm of religion, the teacher would suggest the student come back after school if they were interested in further discussion.

When specifically asked if an attempt was made to cast doubt on evolution nearly every participant laughed in a tone that said, "I have indeed." Even the sole teacher who skipped the chapters dealing with evolution still worked to cast doubt throughout other units. The degree to which they did varied from Enid who said, "Covertly I do," to Peggy who said, "100% absolutely I do. I'm so passionate about it." Darin said,

> My job is to cast doubt, to scrutinize, to pick apart if you will, ideas that might be established, [or] theories or ideas currently held…so yeah, I cast doubt. I'd cast doubt on the cell theory if it helps them learn.

Sharing Beliefs

Participants did not share the specifics of their beliefs as much as they attempted to cast doubt on evolution. When it came to sharing their beliefs, teachers were hesitant about crossing too far into the realm of religion. They were more than willing to lead students to the belief that God exists. They did not get into the specifics of the timeline of creation or how long ago they believed it was but rather attempted to open or reinforce the belief that a Creator exists and there was evidence of design.

A conscious effort to keep the door open for conversations outside of school hours exists among participants. James said,

> In fact last night we had what's called 5th quarter where kids come in after the football game and just hang out and it's an opportunity to encourage them, but also let them know that I'm identified with the school. They know me as Mr. P. I'm the youth pastor…and it lets them know I can have real conversations with them about faith and about God.

Participants are very willing to discuss their faith with colleagues and many have had conversations with their administration about how they handle evolution. When one participant was asked if there were any misconceptions his colleagues had about him believing in creation, he responded by saying there were not misconceptions because he is so vocal about his beliefs there is no way anyone can misunderstand.

One of the journal prompt questions dealt with participant willingness to participate in a Christian evidences seminar. Participants responded by saying, "I would love to," "I would participate," and "Absolutely, without hesitation." Molly said she would decline, not because of her convictions, but because she is a woman and speaking in such a venue would make her

uncomfortable because of her religious tradition. Some had already participated in public forums where they could share their faith such as their local church, youth camps, and conferences.

Legal Understanding

Teachers were not aware of the legal status of what they were allowed to share in terms of their faith. None knew of any specific law or policy that would hinder them from discounting evolution or promoting creation. There was more of a vague sense of "we're just not supposed to do that." When asked if there were any laws or regulations in place that limited their ability to teach based upon their beliefs, Enid said, "Let me think about that one. I guess I can't bring a Bible into my school, like into the curriculum so as far as that's concerned, I know that. As far as others…" She then laughed and went on to say that she needed to pass on this question.

There were those who mentioned the current interpretation of the so called "separation of church and state" doctrine. They did so from an antagonistic viewpoint and believed they had the right to share their beliefs as long as they were doing so from a point of pure information along with an air of neutrality. Shawn believed a balanced approach was required. He said,

> I cannot force my belief on the students, but if the students ask something pertaining to a question about creation/evolution then I can answer that question. If I bring up something about creation then they can bring up something about evolution. If a student brings up something about evolution then another student can say something about creation.

Peggy summed up the general feeling when she said, "I don't know. I'm not sure. Like I said, Nebraska is not on the leading cutting edge of those types of debates, especially not where I live, so I don't know that answer."

Summary

Table 4

Summary of Themes

Theme	Molly	James	Enid	John	Peggy	Shawn	Becky	Hannah	Darin	Lona	Leonard
Confidence in Belief	High	High	High	High	High	High	High	High	High	High	High
Self-Efficacy in Teaching	High	High	High	High	High	High	High	High	High	High	High
Non-Avoidance of Evolution	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Casts Doubt on Evolution	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subtly Promoting Creation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tension Between Colleagues	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No
Community Support	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fosters Student Relationships	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sharing Beliefs Outside School	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Vague on Legality	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

The experiences of public school biology teachers who believe in Genesis creation are similar. The participants of this study had a strong faith and did not wrestle with the questions of God's existence or human origins. They were adamant in their faith that the creation occurred as recorded in the book of Genesis. It was clear they saw themselves as a Christian first and a biology teacher second.

Relationships are very important to the participants. From interactions with colleagues and administrators to conversations with students, and engaging their community and church, an attempt is made to strengthen relationships. Within the classroom this is done because participants see it as a way to foster student learning as well as because they believe it is the right thing to do.

Although they do not struggle with their faith, there is an awareness about how far they are allowed to go in today's public school climate. This is not based on any knowledge of the law or court cases but on the standards they need to cover and on news reports of teachers who were reprimanded for promoting creation. Participants are all willing to approach or step over their perceived limitations, but those limits may vary depending on community support. Participants who lived in areas they identified as more liberal were slightly more subtle in casting doubt on evolution or promoting creation. Although the degree to which they were willing to promote creation varies slightly, participants shared a strength of conviction that they would maintain their belief and would not teach anything as truth that contradicts their faith.

CHAPTER FIVE: DISCUSSION

Overview

The purpose of this study is to understand the experiences of public school biology teachers who believe in the Genesis account of creation. Based upon the findings described in Chapter Four, there are revelations that tie into the theoretical framework and advance the foundational knowledge that was previously missing from the literature. The results of this study reveal that there are implications that will assist high school administrators, teacher preparatory programs, and future educational researchers in understanding this subset of American public school biology teachers.

Summary of Findings

Public school biology teachers who believe in a literal understanding of the Genesis creation are a small segment of the biology teaching population (Berkman & Plutzer, 2010). Creation-believing biology teachers had a well-defined faith and could articulate their beliefs with a high degree of confidence. All participants of this current study had a high degree of self-efficacy, believing they were good teachers who are teaching science with greater accuracy than their peers who believe and teach Darwinian evolution.

Research question one asked, "How do the teachers perceive themselves in terms of being a Genesis literalist in the public school system?" Data collected shows that participants have been heavily influenced by their family, church, and various apologetics groups, but they relied primarily on the first few chapters of Genesis to provide the foundation for their belief. With the exception of two participants who knew each other, the participants did not have any type of professional support network to lean upon. Participants viewed themselves as being

Christians first and biology teachers second and viewed the interaction with students as part of their Christian calling.

Research question two, "What external conflicts have arisen as a result of the teacher's beliefs and practices?" was answered with the realization that experiences of creation-believing biology teachers are strikingly similar. Most cited a supportive community and administration. There were no participants who had ever had a conflict with parents for sharing their creation belief or by exposing perceived weaknesses with Darwin's theory of evolution. All teachers in the study believed they had a good relationship with students and although students are prone to debate, all discussions were kept cordial and respectful. The conflict most mentioned by participants was the interaction they had with other biology teachers within their school. These did not rise to hostility, but some participants believed their colleagues believed they were ineffective or not "real" science teachers because of their belief.

Research question three asked, "What internal conflicts and struggles have arisen as a result of the teacher's beliefs and experiences?" Data collected regarding this question was revealed to be minimal. No participant claimed to have wrestled internally about what they believed or what they were required to teach. The closest to an internal struggle that occurred was the conscious decision to impart information that would cast doubt on evolution and wondering if it was enough to counter the textbook or other Darwinian sources.

Research question four asked, "How have the teachers responded to internal or external conflicts in terms of changing their behavior or practices?" The data revealed that participants readily interacted with others and were willing to discuss their beliefs. Most conflict came from external sources and participants responded that external conflict was minimal. When conflict arose between colleagues, participants were willing to share insight about evidences for creation

or question their fellow teachers about what participants saw were flaws in evolutionary theory. Participants did not see interaction with students as conflict but would accept student questions and challenges as the normal interaction between student and teacher.

The responses dealing with research question five, "How does the teacher navigate his or her beliefs and practices in light of conflicts and evolutionary expectations?" were consistent among all participants. Participants relied heavily on the Bible and upon their local church. In doing so they always had a reference point with which to orient themselves in light of any external conflict. Participants believed they needed to be the best biology teacher they could be without neglecting any science standard, as long as it fell within the parameters of their biblical faith. If participants believed teaching expectations or relationships ever ran counter to what the Bible teaches, they admittedly would gravitate toward the Bible and hold their faith on the higher ground.

Discussion

According to the findings of this study, the biology teacher who believed in the creation account had a high degree of self-efficacy in both their personal and professional lives. According to Bandura (1977) self-perception directly shapes one's thoughts and actions. Studies conducted on teacher self-efficacy and effectiveness have shown that if they believe they can do a good job in educating students then indeed they will do a good job (Hewson et al., 1995).

Research Question 1

Prior to this study, the research has been silent as to how teachers who believe in Genesis creation perceive themselves as teachers in the public school system. When only acknowledgement among educational researchers is given without insight, incorrect assumptions are prone to be made.

Strong Belief

Research question one asked, "How do the teachers perceive themselves in terms of being a Genesis literalist in the public school system?" Participants in the study believed they were more accurate in their understanding of the created world and were thus better teachers for imparting the correct knowledge to their students. In light of the literature that acknowledges the ethics of asking teachers to teach topics they do not believe in (Long, 2012), the participants of this study did not portray the attitude of the victim and did not feel they were part of an ethical dilemma. Many teachers even mentioned the state testing in a positive light, believing that the results spoke for them being effective teachers.

Although most participants were subtle in their promotion of their creation beliefs, they were much more aggressive in pointing out perceived Darwinian weaknesses. The strategy is to leave students with only the alternative that God created all things which is reinforced by both guiding the discussions and through hints. Hints include terminology such as "designed" and "created." Participants' views and actions coincide with each of Schwartz' (1997) designations of Christians in the public schools. Many participants would fit as the *Agent of Enculturation* believing that God has called them to be a good influence. In terms of pointing their students to the conclusion that there is a Creator, they also fall into the *Christian Advocate/Evangelist* as they are attempting to remain undercover in the promotion of their faith. Participants believed they could do more good by remaining in the classroom and not being so aggressive as it would draw attention to their beliefs from those hostile to creationism. Finally, Schwartz' view of the *Golden Rule Truth Seeker* describes the participants more accurately than the Agent of Enculturation or the Christian Advocate/Evangelist. The Golden Rule Truth Seeker

acknowledges the right of non-Christians to formulate and come to their own conclusions. Participants often told students to do their own research and follow the evidence.

Love for Science

Schoon and Boone (1998) relayed what has become common knowledge in teacher programs in that "teachers' poor self-efficacy has resulted in a science anxiety, poor attitudes toward science, and in an unwillingness or hesitancy to spend time in science" (p. 555). The converse is true in that participants who enjoyed and felt positive about their specific discipline were more effective at instructing students. Biology teachers who believed in Genesis creation all displayed a passion for the teaching of science. Several of the biology teachers interviewed in this study made a connection to their own childhood. There is a solid connection between that which people love and how effective they perceive themselves. Participants all believed themselves to be highly competent teachers and rated themselves with a high level of self-efficacy.

Riggs and Enoch (1990) noted that strong efficacy beliefs refer to the extent teachers are capable to have a positive effect on student achievement. The participants in the present study expected to have an influence on their students' lives. Participants viewed themselves as representatives of truth and the closer their students come to understanding truth, the more profound the impact and the more empowered their students will be. Participants believed they had a greater understanding of truth because they were strict adherents to the scientific method and believing that the scientific process can reveal information from the natural world. They also viewed themselves as messengers of God in that they believed they were stewards of inspired truth and part of their Christian duty is to either teach the Bible, or in the case of the context of their classroom, at least counter what they perceive as error.

Research Question 2

The public image of biology teachers who believe in creation is based upon reports from popular media and are usually based on a narrative of conflict. For research question 2, "What external conflicts have arisen as a result of the teacher's beliefs and practices?" the following themes emerged: sources of tension, community support, and student relationships.

Sources of Tension

Sources of tension that arose were primarily from biology teachers who believed in evolution that taught within the same school. Although the literature remains silent in terms of studies done on inter-teacher conflict, there is an underlying theme within the literature of seemingly inflammatory language that underlies the principle that the majority of evolutionary believing biology teachers looks down upon those who believe creation. For instance, the title of the article, "The Creationist Down the Hall: Does it Matter When Teachers Teach Creationism?" (Moore & Cotner, 2009) in itself reflects the majority in the scientific community and conveys the idea of an us versus them mentality between teachers of different belief systems.

At the conclusion of the study, surprisingly no participants mentioned administrative or parental conflict. News reports and court indicate there is a constant battle raging. For instance, Berkman and Plutzer's (2011) article "Defeating Creationism in the Courtroom, But Not the Classroom" brings to light the apparent nationwide tension that exists. There is a combination of both indifference and some level of support from parents and the communities of participants of this study since they do not voice complaints regardless of the level of anti-evolution instruction that occurs. Likewise, according to participants, administrators who knew about the intent of the creation-believing teacher were either indifferent or supportive to their practices.

Community Support

The community in which a person lives can have a powerful impact on how overtly a person lives out their beliefs. Studies have been conducted from the evolutionary biology teachers' perspective (Goldston & Kyzer, 2009; Lac et al., 2010) in regards to how they are influenced by the community. The frustration of the majority of the evolutionary believing biology teacher researchers is that conservative communities and parents pressure teachers into either skipping or lightly glossing over chapters dealing with biological evolution.

Participants of this study were very comfortable in their communities. In light of the fact that seven participants were from the area of the country considered the Bible belt, this is not surprising. Even the participants from California and Florida, although they expressed an awareness their states were not as conservative, echoed the same feeling of support as their mid-western and southern counterparts. In this study the biology teacher who believed in creation had a core foundation between themselves and the Bible. In addition to participants' reliance upon the Bible, they looked to their family and church for support, but not necessarily out of a desire to justify beliefs but rather as having a safe place they can freely teach others. Participants then looked to their fellow teachers and administrators for validation that they were good teachers and they seemed to use feedback from colleagues, administrators, and even test scores to justify they were good biology teachers and thus felt justified in having a little more flexibility to modify the evolutionary view.

Student Relationships

Student relationships were important to participants. The connection between the teacher and student is visited in the literature. Studies (Kose, 2010; Moore & Cotner, 2009) have been conducted on college students with the purpose of them having to reflect back on what was

taught to them by their high school biology teacher. All participants involved in this study regarding biology teachers who believe in Genesis creation appeared highly attuned to both their students' academic and spiritual needs.

Participants were very conscientious of their role in introducing biological ideas upon which a student might rely in the future or which might impact a student's worldview. The participants were very deliberate in explaining Darwinian concepts while being mindful of the students' belief system. The teaching style is best described as a respectful tact along with the hope of convincing students that evolutionary theory is faulty. Although there are both evolutionary and creationist teachers who are harsher with their criticisms of those with whom they disagree, participants of this study all conveyed the attitude of wanting to convince without belittling their students.

Research Question 3

Understanding any internal intellectual or emotional wrestling is necessary to fully understanding the range of experiences biology teachers who believe in creation go through. Research question 3 asked, "What internal conflicts have arisen as a result of the teacher's beliefs and practices?" The following theme emerged: internal rationalization and justification as to how much time to give evolution. .

Internal Rationalization

In the larger debate of creation versus evolution, tension exists on a variety of fronts. There was a general awareness among participants that hostility towards their position on creation existed in the world. This awareness has caused them to formulate and refine their views in a way that they believed they were being true to the biblical narrative. Participants appeared comfortable at the intellectual point at which they had arrived and did not wrestle with

the concepts of God's existence or of how the world came to be. The literature points to religiosity (Kose, 2010; Lac et al., 2010) as being a good indicator of whether or not a teacher will promote evolution or creation in the classroom. Many in the evolutionary community believe that biology teachers who believe in creation do so because they actually misunderstand evolutionary theory. This misconception has placed much emphasis on teacher preparation programs to readjust their content (Schoon and Boone, 1998). The belief that a lack of understanding of evolution is the reason for non-acceptance does not appear to be the case for the participants of this study. They all seemed to have a firm grasp on the overall theory along with its nuances and used the appropriate terminology correctly in all discussions.

Participants in this study were also very conscientious in not following creationist stereotypes. Evolutionary stalwarts sometimes take a tone of superiority and mock the creationist who says, "I didn't come from a monkey," correctly stating that the theory teaches common descent from a shared ancestor. Participants in this study were careful to present exactly what the theory of evolution states. It was obvious they knew both the popularized portions of the theory as well as the more subtle ones. Only after they have carefully presented the material accurately did they then explain what they perceived to be flaws.

Research Question 4

Insight into one's persona is revealed when the response to conflict is studied. Research question 4 asked, "How have the teachers responded to internal and external conflicts that have arisen?" The following theme emerged: maintain professional relationships.

Professional Relationships

All participants worked to maintain a professional relationship with their colleagues even though their views on origins differed. Participants in the study were able to maintain good

relations with their colleagues, sometimes claiming good friendships existed. This appears to run counter to what the literature says as often the tone of journal articles is one of frustration or possibly hostility over what is considered the underlying theory in biology (Moore & Cotner, 2009). Participants used these good relationships to dialogue with those they worked with hoping to influence them, but no participant ever mentioned swaying a biology teacher who was a firm evolutionary proponent.

Research Question 5

Understanding the intellectual and emotional process of reconciling faith and professional responsibilities among biology teachers who believe in creation was a key thrust of this study. Research question 5 asked, "How does the teacher navigate his or her beliefs and practices in light of conflicts and evolutionary expectations?" The following themes emerged: teach evolution, discount evolution, share beliefs, and participants have a vague legal understanding.

Teach Evolution

Participants are all willing to teach evolutionary theory. The misconception in the literature is that it tends to cause the reader to believe that biology teachers who believe in Genesis creation are either practicing avoidance or watering down the evolutionary teaching. It would seem that participants were in fact spending more time teaching evolution than other topic. They believed students must know the theory for several reasons. They were aware of the state and district standards and attempted to abide by them. The general understanding was that the state expects understanding of evolution and does not necessarily require acceptance. White (2009) recognized the importance of religion to teacher identity and the question is debated as to whether acceptance or simply understanding should even be a goal (Berkman & Plutzer, 2010).

Participants who believed in Genesis creation also believed evolution should be taught because they identified Darwinian evolution as erroneous and the best way to combat error is to teach the truth. In order to counter evolutionary arguments, participants believed students must have a firm grasp on the teaching itself. Participants were engaged with students and were willing to answer questions about evolutionary theory or about their own personal beliefs. They were unwavering, though, that evolutionary theory is flawed and should not be taken to represent how the current living organisms of earth came to exist.

Discounting Evolution

The study done by Griffith and Brem (2004) did not mesh well with the participants of this study. Griffith and Brem identified three categories of teacher. The *Conflicted* teacher struggles with their own beliefs, the *Selective* avoid difficult topics, and the *Scientists* are those who do not want social issues in the science classroom. The assumption of the Griffith and Brem study was that the teachers embraced evolutionary thought but had varying degrees of conviction or struggled against conservative social pressure. One of the participants would have been classified as Selective due to primarily avoiding the topic, but the others would certainly not be labeled Conflicted. The closest label would be that of the Scientists with the adjustment being that they did not feel creation science to be a social issue. The participants of this study were just as willing to discuss evidence of design as the evolutionary teacher is to promote Darwinian teachings.

Biology teachers who work to undermine evolutionary theory or promote creation clearly demonstrate Schoenfeld's teaching in context theory. His work attempted to explain how a teacher's belief impacted their teaching to the extent to better explain how teachers responded in a given situation or in other words, how teachers made decisions "on-line." The statements

made by Rice and Kaya (2012) were addressed and explored throughout this study. They wrote, "Exploring teachers' views on evolution is particularly pertinent, given that teachers' acceptance or rejection of evolution is highly likely to influence their instructional practices related to this topic" (p. 168). Creation-believing teachers have spent years defining and refining their faith. Even teachers who are relatively new referenced both their high school and college years as a time of solidifying their beliefs and building an evidence base that would support and reinforce their faith.

Participants were highly adept at being able to guide the conversation to one that shows evolutionary theory in a negative light. White (2009) asked the question, "How are teachers navigating their own religious beliefs as they choose and implement curriculum?" (p. 864). Participants believed they were helping the students to use reason and logic to come to a conclusion they felt was in line with both scripture and the scientific method. There was no hesitation or timidity in what the teacher believed and communicating their view of the truth, although the degree of bluntness may be tempered depending on the classroom dynamics of the moment.

Sharing Beliefs

According to the literature, creation-believing biology teachers are in the minority (Berkman & Plutzer, 2010) with 13% supporting creation or Intelligent Design, with much fewer actually supporting the young earth version. This has not stopped participants from teaching without violating their conscience. They accept the teaching of Darwinian evolution, but it is from the stance of knowing what it claims and why they do not believe it is a viable option. Although participants had the realization they were in the minority, they were more than willing to engage others who asked them about their beliefs and in some cases seek out a more

welcoming forum to teach others about Genesis creation. The tone of the conversations was one of absolute certainty. Being in the minority did not hinder the expression of belief and in fact seemed to strengthen participants' resolve in a way that they believed their understanding as superior, yet surprisingly without a sense of arrogance. They viewed themselves as both scientists and messengers in helping students to understand the created world. White (2009) commented, "One's personal identity cannot be separated from one's professional identity and these attributes indicate that religion is an influence on the construction of a teacher's professional identity, and therefore warrants further exploration by the educational community" (p. 863). White's suggestion of further exploration on identity has been thoroughly investigated throughout this study.

Legal Understanding

No participants believed they were violating any laws by denouncing evolution or promoting creation. The general consensus was that the standards required understanding of evolution rather than acceptance and as long as students understood Darwin's theory, then the state mandates had been met and they were not in violation of their contract. The idea of understanding versus acceptance is an ongoing debate as was discussed by Cobern (1994). There was a sense among participants that the government did not want them to bring God into the classroom, but when it came to teaching their understanding of the truth, they would side with what they believed was right rather than what the laws of the land might say. The willingness to acknowledge God and the Bible as the ultimate authority is consistent with the Christian belief that persecution, should it come, is welcome and a sign of faithfulness. Although participants were not attempting to stand out and become a modern day martyr, they were willing if that should happen.

Implications

Understanding the experiences of public school teachers who believe in Genesis creation has implications for many stakeholders. Policy makers and administrators can always benefit from learning about those whom they supervise. Researchers who are interested in what is occurring in American school biology classrooms are also able to take away valuable insight, which up until this point was silent in the literature regarding the creationist perspective. The teachers, both evolutionist and creationist, should be able to understand the larger debate that is occurring outside of their classroom.

Administrators

An effective administrator should know why teachers do what they do. Many administrators recognize that what a teacher believes directly impacts what they teach and sometimes the quality of what they teach. Gaining insight into the subgroup of biology teachers who believe in Genesis creation can be valuable in understanding the instruction for which an administrator bears some responsibility.

The participants in this study were highly efficacious. An administrator may agree or not with their views, but the participants could be valuable mentors to new or struggling teachers. Paired with the right person, the potential exists for these teachers to assist others in their professional development. They had refined their belief to the extent that they knew who they were and what they taught and were confident they were effective at what they do.

Researchers

Researchers should be aware of the rationale and cognitive process behind being a creation-believing biology teacher. Quantitative studies have revealed what percentage of biology teachers hold varying degrees of beliefs; however, the literature is silent regarding the

experiences of public school biology teachers who believe in Genesis creation. If the participants in this study represent the larger population of biology teachers who believe in creation then perhaps the image of the creation-believing teacher as portrayed in the literature should be altered. The participants of this study were not ignorant in the ways of biology and were very well-versed in Darwinian evolution. Most participants were also not willing to skip or skim over the chapter simply because they did not agree.

Participants of this study loved science to the point that their enthusiasm for their subject clearly came through during the interviews. These were not teachers who were trying to covertly infiltrate the public school system on some type of evangelical mission, but were teachers who truly wanted students to have the best understanding of scientific concepts they can have. They did not want to limit dialogue but encourage and promote conversation about origins whenever possible.

Biology Teachers

Biology teachers have the potential to face public scrutiny more so than any other branch of science. Parental involvement and religious influence can cause emotions to flare when topics are not aligned with family values. This study can help both the creation and evolutionary believing teachers to understand the wider picture of what is going on across the country and to respectfully dialogue with one another. Teachers who do not believe in Genesis creation should recognize the passion for science that exists in their peers, and those who do believe in creation should follow the example of the participants of this study in maintaining respectful communication.

Limitations

This study was limited in that it relied on volunteers who self-identified as biology teachers who believed in Genesis creation. Emails were sent to apologetics groups, churches, individual teachers and schools. Those who agreed to participate had to have a certain level of confidence in themselves and their belief system in order to even want to be in the study. Several potential participants were contacted who had been written about in their local newspaper for teaching creationist views or distributing creationist literature. Although some dialogue took place, none of these individuals agreed to be a part of the study. Perhaps they already felt as if they were exposed or due to legal measures taking place did not want to be recorded.

The original study was intended to also have the requirements of teaching for a minimum of three years, being currently active as a teacher, and currently teaching biology. Many potential participants lacked these criteria. One participant had only taught for a single year. Others had taught biology, but their current assignment was in another branch of science. Two individuals were retired. The study parameters were broadened to accept these individuals. This does not appear though to have had a significant impact on the outcome as regardless of current assignment or years of experience, participants had highly similar experiences and conducted themselves in much the same way.

Technology may have been a limiting factor as well. Interviews that were conducted face-to-face tended to last longer than those which were done through Skype or Google Hangouts. Likewise, the video forums lasted longer than those who were only able to communicate through a phone interview. If distance were not a factor, face-to-face conversations may have been more effective and resulted in a larger quantity of information.

Recommendations for Future Research

Further study could be conducted on those who have expressed hostility from their administration or community. Perhaps those who have faced legal problems as a result of their faith would have a different outlook on their time as a biology teacher. Several individuals were contacted because of their community or legal problems. None of those contacted desired to be in this study. Even though one biology teacher came from a Christian background and had distributed creationist literature, she gave a curt response saying, "Do not contact me again." Another was at first cordial and an in-depth phone conversation took place, but after the consent form was mailed, the individual would no longer respond to communication. If someone were able to develop a relationship with these teachers, perhaps research in the form of a case study would be able to be conducted.

Also, exploring different influences among participants warrants further study. Many in Churches of Christ tend to favor the Christian evidences group Apologetics Press, while other evangelical groups mentioned Answers in Genesis or The Institute for Creation Research. Ken Ham was mentioned as an influence by a few participants, but there did not seem to be a singular personality that dominated a creation-believing belief system.

Conversely, it would be valuable to know if any negative influences fuel a passion to "dig in" and maintain a faith based in Genesis. Questions in this study were focused more on what participants stood for rather than what or who they were against. Surprisingly, considering the recent Ken Ham and Bill Nye debate, Nye was not mentioned. The only antagonist mentioned by participants was Richard Dawkins and only by a few.

This study explored the beliefs and experiences of a specific creation-believing worldview. There are many varying viewpoints of the book of Genesis. Further exploration is

warranted on the theistic evolutionist as well as those who believe God created all things over long time spans. Similarly, participants were all categorized as evangelical Christians. Further exploration could be done on other major belief systems including Catholics or Muslims who also hold to a creation account.

Summary

Public school biology teachers who believed in Genesis creation were a small, yet highly efficacious group. They firmly believed in a literal understanding of Genesis and were not willing to compromise their faith. All participants in the study viewed themselves as highly successful teachers who enjoyed what they did and believed their primary role in the classroom was to impart to students correct information about biology and to shine the light of the scientific method on man-made origin theories.

Creation-believing teachers interact with a variety of stakeholders and seem to be able to navigate their beliefs in a way that is in harmony with their community. They enjoy the support of their administration and parents, while occasionally having to maintain professional disagreements with colleagues. The small amount of friction they claim to have faced along with constant tension from the curriculum standards has only entrenched them further into their beliefs. The belief that God created the world in six literal 24-hour days rests upon the narrative contained in the book of Genesis but also through a personal investigation of creation-based science. They believed both biblical and observed evidence points to the same conclusion and reinforces their Christian faith. As one participant said, “If I can’t believe the entire biblical account I can’t stand on any of it. I don’t get to pick and choose what I like and what I don’t like.”

Creation-believing biology teachers held fast to the principle that correctly representing the biblical narrative was not just their religious tradition, rather they believed their actions have eternal implications for both themselves and their students. As one participant emphatically stated,

> I will keep doing my part as a biology teacher, as a Bible class teacher, whatever it takes to make a difference for my kids, the ones in my house and the ones in my classroom, in their ideas about their Creator.

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APPENDIX A: Situation to Self

I was raised in a Christian home and have always been taught that God was Creator of the universe. As I entered young adulthood I attended a Christian college in West Virginia while working as a youth minister for a local church. Throughout this time I self-published a book that was intended to build the faith of children in regards to the biblical account of the global flood of Noah.

Upon graduating from college I worked for three years as a science teacher in the areas of earth science, physical science, biology, and chemistry in two different Christian schools. During this time I taught from the perspective of a young earth creationist worldview.

For the past ten years I have taught grades 3-5 in a public school. During this time I completed my Master's degree in Science Education. After becoming more aware of the legalities surrounding the creation-evolution debate, I wrote another book that was accepted for publication by a local company that was intended to cast doubt on evolutionary theory without bringing religion into the story. In addition to my teaching career I have also been a local minister for the past ten years where I continue to promote the Genesis account of creation. The church has a local cable television program that airs weekly so my teaching is very public, though it is not thought that there are a large number of viewers.

In my current position as a 5th grade science teacher, there is little conflict between my faith and job. Occasionally, a video will be playing that will mention an old earth time frame or will language that promotes Darwinian theory. If I know the information is on the video I use that time to refocus students or review a previous section until the evolutionary segment is over. Some students have seen me preaching on the television program and are often excited to inform me they watched. Every year one or two students usually ask me what my beliefs are and I

answer their questions directly but do not elaborate beyond a simple statement. I read my second book aloud to my classes, as have other teachers at the school.

APPENDIX B: Screening Questionnaire

1. Do you identify yourself as a Christian?
2. How many years have you taught biology in a public school?
3. Are you fully certified to teach high school biology in a public school?
4. Do you believe the following statement, “God created everything including the universe, earth, and humans in six literal 24-hours days within the past 10,000 years as is recorded in the book of Genesis?”

APPENDIX C: IRB Approval

Dear Eric,

We are pleased to inform you that your above study has been approved by the Liberty IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases are attached to your approval email.

Your IRB-approved, stamped consent form is also attached. This form should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document should be made available without alteration.

Please retain this letter for your records. Also, if you are conducting research as part of the requirements for a master's thesis or doctoral dissertation, this approval letter should be included as an appendix to your completed thesis or dissertation.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

Fernando Garzon, Psy.D.
Professor, IRB Chair
Counseling

(434) 592-4054

APPENDIX D: Science Teaching Efficacy Belief Instrument*

[redacted]

[redacted]

*In Riggs, I., & Knochs, L. (1990). Towards the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education, 74*, 625-637.

APPENDIX E: Demographic Questionnaire

Name _____

Teaching Certification (State and licensure) _____

Years of Experience _____

Ethnicity _____

Gender _____

Religious affiliation _____

Please provide a brief demographic description of your school

_____

_____

APPENDIX F: Interview Questions

1. Why did you become a teacher?
2. What made you decide to teach in a public school?
3. How would you describe your views on the creation of the universe? Humans?
4. What are your personal feelings of the creation account from the book of Genesis?
5. As a public school science teacher who believes the book of Genesis, what have you experienced that has impacted your teaching practice in regards to origins?
6. Who or what has had an impact on your beliefs as a teacher who believes in the Genesis account of creation?
7. How do you handle conflicts between what you believe and what you are required to teach?
8. How do you respond to student questions that are in conflict with your beliefs about creation?
9. Which regulations or laws are in place which limit your ability to teach science based on your beliefs?
10. Have any individuals or organizations ever caused you to feel that you needed to either suppress or teach a lesson with which you were not comfortable?
11. Do your personal beliefs effect your relationship with your colleagues within the school? What about your field overall?
12. What conversations have you had about your beliefs with students, parents, or colleagues outside of school hours?
13. Have you ever attempted to cast doubt on evolution or promote creationism? Please explain.

APPENDIX G: Focus Group Questions

1. Please introduce yourself, your school, and the specific grade/classes you teach.
2. Where did you receive your content specific training and who/how were you influenced?
3. Would you share your journey of trials and what solidified your current belief in Genesis?
4. From what sources are you currently influenced?
5. What have you experienced in the classroom that you would like to share?
6. What have you experienced in the school environment outside of the classroom?
7. Are you familiar with influences on biology curriculum in your state? At the national level?
8. Do your standards emphasize acceptance or understanding of Evolutionary theory?
9. What issues/trends do you see facing Christian biology teachers who believe in the Genesis account of creation?
10. What misconceptions do your fellow biology teachers have with your view of origins?
11. What misconceptions does the general public have regarding your view of origins?

APPENDIX H: Journal Prompts

1. How would you respond to a student who directly asked you what you believed?
2. If you were asked to participate in a local Christian evidence seminar, how would you respond?
3. How would you respond to a young, new teacher who came to you expressing frustration about tension from religious parents over evolutionary content?

APPENDIX I: Themes and Significant Statements

Theme: Reasons for Teaching in Public School

Molly	• I always wanted to be a teacher. • I love school and I loved learning. • Just stayed in public school
James	• A desire as a calling from God. • Great experiences within schools • Football coach had a huge impact on my life • That was what I was familiar with • I feel I can make a difference for God's kingdom as being a positive influence.
Enid	• Got interested in science • More job opportunity
John	• To become a cross-country and track coach • The money and opportunities
Peggy	• A passion • I prayed about it. • Good blend for bringing together my love for science, math and logic and my love for working with kids • Only option
Shawn	• I wanted to be a teacher • Private school never even entered my mind. • I went to public school…I went back to a public school.

Becky	• There was a job opening • I looked closer to home for a job…so I just switched to a public school
Hannah	• I did some wilderness tripping and was teaching some survival skills and I really liked it so I went back to school to get my teaching degree. • Versus private school? The money.
Darin	• I enjoy to see that I was helping somebody. • My initial reaction was public school. I didn't really think about it.
Lona	• I loved studying human anatomy and physiology. I finally decided to major in biology education.
Leonard	• I really enjoyed working with them and I guess I went into science and physical education because I really wanted to coach. • I ended up having two majors, so that's why I ended up teaching. • I never thought about anything else… I never thought about teaching in a private school. • I attended a public school and I never thought about anything else.

Theme: Genesis Belief

Molly	• I believe in the young earth. Six literal days of creation. Human beings created on the 6th day, fully formed and everything with apparent age. • …it kind of fascinates me that the Bible starts with light. • I don't feel the least bit threatened. • I believe in a young earth.

James	• I go right off the script of what the Bible says. • …everywhere in the Bible that says, day "yom" it means a 24 hour period so my belief is that God spoke the world into existence and the days of creation are exactly as laid out as in the Bible, including the place of man within that as created in God's image. • We're not animals. • I'm looking through a biblical lens and what the Bible says and focusing on that rather than man's wisdom. • God could have spoken the world into existence in a millisecond if that would have been His pleasure. He is sovereign. He is in control. • It makes sense…in the book of Genesis • It's possible because all things are possible with God, that's how He designed it, that's how He created it. If I can't believe the entire biblical account I can't stand on any of it. I don't get to pick and choose what I like and what I don't like. • I prepare myself prayerfully. • In God's word it tells us that we're supposed to follow the laws… • God is supreme
Enid	• I believe in the Genesis account, 6 days God created and one day, and on the seventh day He rested. Then humans were also created by Him as in the Bible account. • I stand for what is truth, for what I believe is truth.

John	• In the beginning was the Word and the Word was with God and the Word was God. He was with God in the beginning. Through him all things were made; without him nothing was made that has been made. • Started with 6-24 hour days, beginning about 10,000 years ago • With fully formed plants and animals with the appearance of age • Adam was created first followed by Eve…each fully formed with the appearance of age • Genesis is a literal account
Peggy	• My view is the Bible is 100% literal that it is 100% accurate the word of God and God created the universe exactly as described in Genesis.
Shawn	• The creation, the earth is no more than 6-10,000 years old. Humans were created in those first six days. Created by the Almighty God. As outlined in Genesis chapter one and Genesis chapter two. The earth was set in a specific place in our solar system for a specific reason and that reason was for humans to be on the earth. • I believe exactly as it says in Genesis chapter one and Genesis chapter two. That those stand for a 24 hour period and that man was created on one of those days. And it was after that that God saw that it was very good. • I'm never not comfortable because of how strong my faith is. • I am not uncomfortable teaching anything because I teach it as a theory. I teach it as a theory. I don't teach it as a fact.

Becky	• I believe in the literal six day creation. That pretty much says it. In Genesis one I believe. • I do believe in the six day literal creation. • I believe it happened. God spoke and it was. • I believe in the six day literal creation and that God created you and me.
Hannah	• I believe the universe was created in seven days by God. That God spoke it into being. That humans are created from the dust of the earth. • It happened in seven days and that God created a mature earth. • When they were created in the way they were created they were mature. • My entire life has been centered around the church and Christianity. Which leads to Genesis
Darin	• I believe in the literal sense as creation as it is written in the Bible. I've a belief that God was the designer and brought it out into existence.
Lona	• I believe God created the entire universe in six literal 24 hour days a few thousand years ago-likely no more than 10,000 years ago, if not less. • Jesus referenced the creation of man and woman at the beginning as though it were a real, literal event. That is evidence from scripture that the account is not figurative. • So I will keep doing my part as a biology teacher, a mother, a Bible class teacher, whatever it takes to make a difference for my kids, the ones in my house and the ones in my classroom, in their ideas about their Creator.
Leonard	• My view is that it came about just the way it says in the Bible.

	• Just the fact that I believe in creation.

Theme: Dealing with Evolution

Molly	• I try to make them understand the idea behind a theory. I tell them you're free to disagree. • …going to be on the West Test or Next Generation or whatever the next test is coming up…what most scientists believe, but you're free to believe what you want. • Most geologists answer this question with billions of years ago. • …see through the problems that people are talking about with Darwin's theory…that's a huge problem
James	• I don't try to belittle the curriculum • …point to the deficiencies within the theories of evolution and also the theories of big bang • Conflict are o.k. because it challenges what you believe • I will at times step over that line a little bit. I'll put my toe over it. • I don't believe bacteria ate another cell and then it became, you know, a cell with a real nucleus and I'm like guys, I just don't buy it. • It says it here in the book and we have to be aware of
Enid	• …when we would get focused on biology like genetics, evolution and those things…like thousands and millions of years ago…I have a little preamble of saying this is something that we have to teach

John	• I must be educated in other popular theories of origins in order to make Genesis discussions acceptable • I allowed students to ask me a question as if I was a creationist, theistic evolutionist, or atheistic evolutionist • …to inform students to the best of my ability of the current information on a topic • My personal goal for each student was to be a well-informed participant in science in order to make important personal decisions.
Peggy	• What I would say was, "This is a theory. Go find out." • I always said Darwin was a theory and natural selection absolutely was true, and there's never been in the history of the world in observable science, any time when there was a jump from one species to another. • …definitely did include evolution, the big bang theory…like I said I did cover that. If you're going to find the truth you have to seek both sides.
Shawn	• As this is one possible explanation of how humans came to be on earth • There are multiple theories and here is one that the state of SC requires you to know. • But I teach it as a theory. • I have some questions back for them about evolution. • In the past we've sometimes had debates about creation vs. evolution. • They can bring up something about evolution…so there's a mutual respect on both sides.

Becky	• I don't want to come across to my students that I'm skipping over this because I just don't agree with that. I think that we need to take it head on. • I will teach evolution as a theory, but I'm not going to say that it's truth and I'm not going to say that it is not scientifically proven because nothing is scientifically proven. You can't say evolution is proven. • I have posters behind my desk that show the two views of the origin of the universe, creation and the big bang and I don't make a big deal out of it, but it's there.
Hannah	• …have to teach something in which we can change such as we can measure change over time in evolution, but have to teach students how to sift through what may or may not be true and to have some ideas for themselves because in order for them to score on a test they have to have some information that you know I tell them that this isn't necessarily the way the earth began and evolution does not mean the origin of the earth, however these are some things you need to know and some terms in order to be an intelligent being. • It's not fair to the students who care about their testing, nor is it fair to my schools test scores, nor is it really fair that it's on that test, but it is. That's how it is. • The big buzzword is evolution and evolution is not a bad word. It's fine.
Darin	• If you look in the textbooks and you look in the standards themselves and the evolution that is being taught is microevolution and the push for macroevolution is more of the problem issue for the theory. • I mention evolution simply because I teach biology

	• I teach the standards, but alluding to the idea that as a scientist you have to look at every option • I'm teaching it. I'll present it to the kids.
Lona	• I tried to approach the topic in such a way that I could be truthful, do my job and teach the objectives I was required to teach, and be true to my faith as well. • I left it to one unit and usually short.
Leonard	• I just got away with skipping the theory of evolution • …just wasn't time to get to evolution in the first semester

Theme: Tension

Molly	• A little argument, not really an argument, just a discussion • We've had some discussions • No one's ever gave me a hard time or reported me to anybody for what I've said.
James	• There is conflict at times. • Other colleagues, some are just indifferent. • This is what you believe and that's fine. This is what I believe and that's fine. • It's still congenial.
Enid	• I gravitate towards those who are believers. • It's just assumed we're going to show this movie, "The Journey of Man" and traits of human ancestry.
John	• A number of Christian teacher I worked with told me I was crazy to even mention anything about creationism.

	• I did have an administrator approach me early in my Christian walk and say that teachers were complaining about my "open faith" around campus and "religious discussions" in class
Peggy	• When they're doing things like that and you are not, you are going to be ostracized. That's just life. The life of a Christian. • But because of my belief in specifically in creation I don't feel like I was ever ostracized.
Shawn	• Not within my school, no.
Becky	• Most of the people I teach with are at church on Sunday.
Hannah	• I do teach with other teachers who say there is absolutely no way you can possible be a decent biology teacher and believe in creation. • I have several colleagues, but one in particular has changed his entire teaching style, comes back to how evolution and how organisms have changed…he teaches the entire class surrounded around that because of the conversation we have had.
Darin	• I think I'm in the exception rather than the rule. • They feel somewhat to the degree I do in speaking with them.
Lona	• The last school where I taught I learned that one of the other teachers-a vocal creationist-was not teaching biology because the department chair didn't feel she could teach evolution fairly. I told her she shouldn't be assigning me to teach biology. She basically said, "Don't tell me that. I don't want to hear it."
Leonard	• No…another biology teacher sort of believed in theistic evolution I think.

Theme: Support

Molly	• I've been very lucky because I've always taught in really small country schools or really small communities like this where people are still pretty conservative and I feel free to tell kids my opinion if they ask me and I've never had any backlash from that whatsoever. So if they ask me what I believe I tell them. I've never got in any trouble so far. • I've had several students who also go to church with me.
James	• I've been blessed that I've had lots of kids that have come into the church or come into the youth group.
Enid	• The red area of the blue state so there's a lot of old school farmers
John	• Christians tell me good luck and be cautious.
Peggy	• Part of the thing for me was that being from central Nebraska, or teaching from central Nebraska we're still very conservative. I don't have influences here that people on the coast are getting. Some of the more liberal types of thinking. It's definitely infiltrated here, but not to the extent the other parts of the country have. We're still the Bible belt. We are still a bunch of farmers out here. I still have the freedom to, and I was blessed, I was never confronted by parents or confronted by parents, or the school board for what I said.
Shawn	• I have never had any parents come back and question about anything about what I've taught about creation or evolution.
Becky	• Because this is a Christian community and we would all support you in that

Hannah	• I've actually not had any conflict conversations, so most of the conversation that I've had have been parent concerns about the content that's going to be presented in class that would be in conflict with religious views.
Darin	• I think I'm very fortunate to have those around me who believe similarly, not across the board agreeing
Lona	
Leonard	• We're a pretty strong Christian area and I don't know if any conflict ever came up over anything that ever happened like some places have a fuss about.

Theme: Student Relationships

Molly	• You're free to grow up and change this. You're free to find more facts. You're free to research this on your own. You're free to investigate any theory I tell you about. • Most students will be confrontational because they think that I'm going to be defending the scientific view.
James	• I have to strike that arrow of neutrality. • I'm not afraid to have some civilized debate even with the ages of 14, 15, 16 years old. • I try to be as transparent as I can be. • …called 5th quarter where kids come in after the football game and just hang out and it's an opportunity to encourage them

Enid	• …this is not necessarily my beliefs, but if you have questions you can ask me about it afterwards • I'm not going to berate that over my students' heads. • If they do want a private conversation, that's fine.
John	
Peggy	• I would offer students more opportunity to come to me after class if they wanted to and I could point them to research and studies and books that presented the other side. • Every now and then I would get a student who was little bit argumentative and I would just go at it. I would say, "Show me the evidence. What do you got?" And then we'd kind of go from there.
Shawn	
Becky	• I had one student ask me if I believed in creation and I said, yes…I'm glad you asked. Let me tell you more.
Hannah	• I had a student say, "Are you religious?" • I said, "Yeah, I am. I absolutely am." So when students want to discuss it that's absolutely fine. There's a big difference between a discussion and a debate. I purposefully stay away from debates with students about how the earth began. • We're not going to solve anything by debate. • Allowing them to voice opinions. Certainly, not knocking that down at all, but helping them understand there is phenomenon that can happen that caused different dating….

Darin	• Then the kids are like, "Yes, I can understand that."
Lona	
Leonard	• I would respond to him with the truth, and tell him that I believe the Earth and life was created by God.

Theme: Legal Knowledge

Molly	• I'm sure there are. I'm sure if the ACLU came around I could be in trouble, but I've never, ever been in trouble at all.
James	• There has to be neutrality. You have to make sure that you're not leading a student to have religious beliefs within a science class.
Enid	• I guess I can't bring a Bible into my school. • As far as others…pass.
John	• The Lemon Test which determines when a government activity supports religion or not.
Peggy	• I don't know. I'm not sure. • I don't know that answer.
Shawn	• I cannot force my belief on the students. But if the students ask something pertaining to a question about creation/evolution then I can answer that question. If I bring up something about creation then they can bring up something about evolution. If a student brings up something about evolution then another student can say something about creation.

Becky	• I didn't get any instruction as far as this is what you teach on this and this is what you don't. I just get a list of things I'm supposed to cover and even that isn't really even regulated like I thought it would be.
Hannah	• I'm sure there are some, but you know, the truth of the matter I believe that I can teach science even with my beliefs. • I don't know if there's a law that says religion doesn't belong in the classroom.
Darin	• I don't know the numbers as far as the history that of court cases that have come up. I've read about them and I know that where that fine line comes in. We're not to teach religion in our classrooms and that's where I think there's a really difficult spot for creation-believing biology teachers that intelligent design is taught different as not being creationism as a theory in of itself and not evolution.
Lona	• The so-called, separation of church and state is the only thing I can really think of that limits what I teach.
Leonard	• I don't know of any.

Theme: Sharing Beliefs

Molly	• I don't think really students or parents unless they go to church with me.
James	• Oh tons. • I'm the youth pastor. • With parents I have similar opportunities. I try to be very, again I guess I'm overusing the word transparent, but I'm trying to let people know what I believe

	and what I stand for outside the school and will converse with anyone who wants to talk about God.
Enid	• I might mention I can't do this, I have to go to a Bible study or something. And then the next question is, "Oh, where do you go to church?"
John	• I offer presentations to church youth groups.
Peggy	• Oh tons, just tons. • So I've had a lot of conversations with kids. How do you know God is true? How do you know the Bible is true? How do you know creation is true?
Shawn	• I don't think I've ever had any conversation with parents or students about creation/evolution. I do have a Bible on my desk and students always ask me, "Mr. Taylor you have a Bible on your desk. You can't have a Bible on your desk." Yes, I can. And they'll say, "What about science and evolution and creation and God?" and I'll say correct science is in harmony with what the Bible teaches us. And that will sometimes happen before school or in between classes. I remember having a conversation with a student about creation/evolution between classes so it took about 3 or 4 minutes.
Becky	• I don't know that I have.
Hannah	• Not many…a couple of parents who are usually concerned about evolution.
Darin	• I don't have many conversations with parents on the issue. Every once in a while I may have a student kind of ask me a few questions and we leave the conversation, hey go out there, do your research, take this inquiry further where I can't lead you. But the principle that we learn in science can, so go out and do

	your research. Leaving them with questions. When I talk with colleagues on the issues, great conversations, very engaging. I look for their opinions, whether they agree with mine or not, but I want to know if they hold these views against creationism.
Lona	• I remember having a conversation with some students about leviathan and behemoth in Job, and looking up some passages like that. I invited a colleague to attend some lectures about apologetics once when an area congregation was hosting it. I've had some conversations with colleagues and students outside a classroom setting. • Most discussions with colleagues happen on hall duty during class changes.
Leonard	• In Bible class.

Theme: Casting Doubt on Evolution

Molly	• I probably have. Especially, if the student asks me a question about evolution. • I have skewed things in that direction.
James	• I really hammer the word theory. • I point to the deficiencies within the theories of evolution and also big bang…some of the dating methods • I will tell a kid, "I don't believe what that says, not exactly." • Definitely. I may say, "That doesn't even make sense."
Enid	• Covertly, yes. I won't say, "I think this is wrong."

	• They'll ask, "What are your beliefs?" I will let that surface to the conversation and use that to open the doors and talk about creation and then kind of steer away the conversation about evolution.
John	• I push the students to know the strengths and weaknesses of evolution and be aware of other theories, especially Genesis. • I tell them that they will have to do their own work, as it is not part of the stated standards of the public schools.
Peggy	• Never in the history of the world, in observable science has there been a jump from one species to another. • I would point out the flaws of evolution. • …brought in some maybe why this is. Why you want to do some more research because there might be some flaws in this issue. • 100% absolutely I do. I'm so passionate about it. • Let's look at the claims of evolution and let's look at the huge cracks in those foundations. Most of the people who believe in evolution start with the premise that there was primordial dust floating around in the universe, floating around in the cosmos and it starts spinning faster and faster and they come up with the story of the whole big bang. Great let's go with that. Where'd the primordial dust come from? You know you just have to keep going back and back and back and once you get back to absolutely nothing, it just popped into existence? What popped into existence and where did it come from? When you start looking at laws of logic, when you

	start looking at Newton's laws of everything, laws of motion, laws of energy, laws of thermodynamics, how could anything come from absolutely nothing. And that's where people get tripped up. Nobody has an answer for that. I've even had a conversation with a high school kids who said aliens put it there. So I said "Great" let's go back to the aliens. Who started them? Where did they come from? So you just keep them going in a circular reasoning until they come to the conclusion that nothing comes from nothing.
Shawn	• In the classroom when I throw some things, some evidence that could possibly lead to disproving evolution, some of the students who profess to be Christians, they light up, they get a little spark in them and then that starts a good conversation in the classroom. • …it never fails a student will say, "Mr. T. why do you keep saying it was designed and then another student will go, "Because that's the way God designed it." • That's a tough one (sarcasm). I will use evidence that is out there for everyone to see and that is available for everyone to use that in explaining the theory of evolution because if it's a theory then you need to use all sides.
Becky	• But I'm always dropping my, "I'll be teaching on the cell and the worksheet will say, "No one knows how all the parts came together," and I'll say, "Well I know why and hopefully you know why." Hopefully, they catch the hint that God created it that way. I don't come out and say it.

	• I know how I teach and the textbooks I think gets a lot of it right, but they get a lot of it wrong and you need to study this to find out what you think. • I think he [Darwin] got a little bit off when he got into decent with modification and the common ancestor thing. That was where he went wrong. So I try to explain that. • …with the common ancestor, that kind of thing, I do shoot that down. • There are alternative theories. • I'm not really allowed to discuss them that much with you other than say there are other possibilities that support beliefs that are out there.
Hannah	• You know I can tell you some facts. I can show you some things. We look at things like Mt. St. Helens when it erupted and we can see all the layers of the earth that should be billions of years old, but actually came from one eruption. • Probably, I'm sure. • I do try to teach again to think critically. • I'm sure that I have maybe not intentionally, but I'm sure that it comes through that I don't really believe, actually, I don't believe at all that the earth could have happenstance formed by a cloud of gasses exploding so I'm sure that comes through.
Darin	• My job is to cast doubt, to scrutinize, to pick apart if you will, ideas that might be established, theories or ideas currently held. You know we would never be where we are as a human race or society if we just said, ho, this is what it should be and don't question it, don't pick it apart.

	• Yeah, I cast doubt. I'd cast doubt on the cell theory if it helps them learn.
Lona	• I preface things with, "Some scientists teach" or "Evolutionists state." • Evaluate the evidence…that's what science is supposed to be about. • He remembered how I had always phrased things and came to the conclusion that I was not an evolutionist. I was able to point him to some places for further study about a young earth and literal 6 day creation. • I try to plant subtle seeds of questioning.
Leonard	• I did put the doubt on evolution and influence creation by saying these things couldn't have happened by accident without overseeing, because when we talk about chromosome number and meiosis and mitosis and how everything happens and there's a plan for everything and we did talk about the fact that one species of dog can breed with another species of dog and a new species of do can be created, but you can't cross a cat and a dog and get cat-dog.

Theme: Creation Promotion

Molly	• You're free to research this on your own. • That's great. That's fine that you believe that. I'm just telling you what we have to cover. Sometimes they'll see through things…they would ask me questions about how adaptations could happen so quickly…
James	• But if someone does make a strong point about creation I can lead discussion that way. • I've had opportunities outside of the school arena to share my faith and belief.

	• So I say it's a theory, not factual. It can't be proven, that's the idea. That's the way I've dealt with it so far.
Enid	• Covertly, yes.
John	• I make it clear that if you choose to believe that Genesis is literally true, you will have constant opposition from not just the above groups, but friends within you community and even church.
Peggy	• See previous statement on "casting doubt."
Shawn	• And if creation is brought up then all sides are used to talk about creation in my classroom.
Becky	• I think the textbook gets a lot of it right, but they get a lot of it wrong also.
Hannah	• It's definitely going to come through that I believe in creation and that phenomenon such as floods can cause the earth and things to look different because of pressure…
Darin	• Even though I'm not teaching it, they kind of pick up on it already.
Lona	• I try to plant seeds of questioning for those who have accepted evolution as fact.
Leonard	• These things just couldn't have happened and I think all the kids agreed with me and a lot of them were really amazed at how genetics worked.

APPENDIX J: Consent Form

CONSENT FORM

A PHENOMENOLOGICAL STUDY OF PUBLIC SCHOOL BIOLOGY TEACHERS WHO BELIEVE IN THE LITERAL GENESIS ACCOUNT OF CREATION

Eric Dougherty
Liberty University
School of Education

You are invited to be in a research study involving Christian public school biology teachers who believe in a literal account of the Genesis account of creation as having occurred in six literal days within the past 10,000 years. The study participants are required to hold a valid teaching license, be certified in biology, and have taught for at least 3 years. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

Eric Dougherty, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information

The purpose of this study is to understand the experiences of Christian public school biology teachers who believe in a literal understanding of the creation account of the book of Genesis. The guiding question for this study is: **What are the experiences of Christian public school biology teachers who believe in a literal understanding of the book of Genesis?**

Procedures:

If you agree to be in this study, I would ask you to do the following things:

1. **Participants must sign the informed consent form.**
2. **Participants will fill out an initial screening questionnaire.**
   5 minutes

Participants who meet the criteria will complete 3-9.

3. **Upon meeting requirements, participants will provide demographic information.** *5 minutes*
4. **Participants will respond to interview questions in a face to face or Skype format. The interview will be digitally recorded (audio only).** *Approximately one hour*
5. **Participants will read their transcript and provide feedback if necessary.** *Approximately one hour*
6. **Participants will respond to prompts through reflective journaling.** *30-60 minutes*
7. **Participants will need to be available to be a part of a focus group through an online meeting format. The focus group will be digitally recorded (audio only).** *Approximately one hour*
8. **Participants will take the Science Teaching Self-Efficacy Belief Instrument.** *5 minutes*
9. **Participants will need to be available for a follow up interview if necessary.** *Approximately one hour*

Risks and Benefits of being in the Study

The study has risks: The risks in this study are minimal. You may experience stress if reflecting on a negative experience or recounting a conflict in regards to the intersection of belief and expected practice.

There are no direct benefits to you in this study. A benefit to society and school administrators would be that a better understanding could be reached about a segment of public school biology teachers.

Compensation

No compensation is provided.

Confidentiality

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely and only the researcher will have access to the records.

Digital data will be stored on a password-protected computer. Transcripts and demographic information will be kept in a locked cabinet. The data will be kept for a 3-year period and then erased or shredded. Due to the nature of the focus group, confidentiality cannot be guaranteed, but will be encouraged.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

How to Withdraw:

You may withdraw from this study at any time. If you wish to withdraw, please email or call me at the contact information below. If you withdraw, all digital files will be deleted and paper data will be destroyed.

Contacts and Questions:

The researcher conducting this study is Eric Dougherty. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at edougherty@liberty.edu or 252-342-4817 or the dissertation committee chair, Dr. Kenneth Tierce, at krtierce@liberty.edu or 940-441-2378.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd. Suite 1837, Lynchburg, VA 24515 or email at irb@liberty.edu

Please notify the researcher if you would like a copy of this information to keep for your records.

Statement of Consent

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS THE IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

__ The researcher has my permission to audio-record me as part of my participation in this study.

Signature _____ Date: _____

Signature of Investigator _____ Date: _____

APPENDIX K: Sample Transcript

Interview Questions

11DWCA

1. Why did you become a teacher?

   P: You know I became a teacher because I was told that I was able to I was easy going and I was able to convey ideas a bit better and was able to read people better and I really enjoy t see that I was helping somebody.

2. What made you decide to teach in a public school?

   P: You know I group up you know in public schools and I have no real knowledge of private schools or charters or anything like that so I guess my initial reaction was public school. I didn't really think about it.

3. How would you describe your views on the creation of the universe including humans?

   P: I believe in the literal sense as creation as it is written in the Bible. I think that any theories or anything that comes close to it is just as viable a theory as creation itself. Either being spoken into existence or some random act, but I'm a belief that God was the designer and brought it out into existence.

4. What are your personal feelings of the creation account from the book of Genesis?

   P: You know I think in light of the different theories that come out that it's not a literal day or that it's millions of years or I think it's trying to shoe horn the idea of what's contained in the Bible as something it's not. I think the whole idea is trying to appease, for whatever reason think what they do in science and are trying to apply it to some other theory and just trying to make it fit there scenario than trying to take it for what it is.

5. As a public school science teacher who believes the book of Genesis, what have you experienced that has impacted your teaching practice in regards to origins?

   P: Specific or in general?

   I: Anything that comes to mind that has had an impact on you for good or bad

   P: I wouldn't say there's anything that's really bad, otherwise I wouldn't be a science teacher. I, in view of you know of creationism and my views on it I would say there have been some real impact when I come across a colleague or just someone I work with or someone who teaches the subject who is not open minded and they really my impression of it is that it's over the top and it feels like an attack right from the get go. Or if they were to find out "Oh you believe in this Bible" or "You believe in this." You know it's really sets me back a little bit it sets me back and makes me say, wait a minute are you attacking me or my belief or why such passion behind it. I guess they just can't accept the idea that someone else would disagree with them who also teaches science.

6. Who or what has had an impact on your beliefs as a teacher who believes in the Genesis account of creation?

   P: You know there was, there, I knew I wanted to be a teacher before, because, one my biology teacher himself, I don't know his views, but he really got me interested in biology and the cell itself and it just amazed me. And started to follow my own interests and studying it on my own I came across a geologist by the name of ********* who is also a gospel preacher in Texas and he was invited to come out to our congregation here in California and speak on his findings as a geologist and his own studies and the way he was able to convey certain things and his own discoveries are just and the way he was able to express them it was what I was really unable to say to someone who didn't believe in

creationism, but he was able to convey it so much better. And he got me interested into not just biology, but geology and the conflicts that arise in you know all of science's theories which include, which overarching is evolution and how it reaches into other subjects like geology and anatomy and these other areas of science. He really connected it all and was influential in my own studies and my beliefs.

7. How do you handle conflicts between what you believe and what you are required to teach?

   P: You know I'm relatively a beginning teacher, I'm in my third year and I've yet to experience to many specific conflicts, however I'm in my master's program and I've chosen my master's thesis to in education to study how teachers teach evolution as how it applies to the standards here in California and what I've found out is overwhelmingly the standards themselves, they don't, it's like they tippy toe around the idea and the mainstream science media and they're really pushing for evolution, but if you look in the textbooks and you look in the standards themselves and the evolution that is being taught is microevolution and the push for macroevolution which is more of the problem issue for the theory, I think my own study has helped me in my own in how to reconcile difficulties in my own teaching, I guess to answer your question, how do I deal with it. I dig deeper. I don't just say, well this is what I believe and hang my hat on that. I'm a science teacher because I believe in the rationality of the world God created and that there is organization behind it. I'm a firm believer of intelligent design and I guess digging deeper is what helps me get me through the day if it's tough.

8. How do you respond to student questions that are in conflict with your beliefs about creation?

P: You know teaching high school there are students who every once in a while they want to address the idea of evolution they have this idea of what evolution really is and when they're able to and I mention evolution simply because I teach biology and its really helpful when I talk to the kids and I'm able to, I teach the standards, but alluding to the idea that as a scientist you have to look at every option. You cannot discount something simply because it's your belief and I'm a practitioner of what I say so if I'm telling them to do that and they object with my creationist view, even though I'm not teaching it, they kind of pick up on that already and kind of say what about this and if they see me there's evidence either way and it's how you interpret that evidence that helps you become a better scientist.

9. Which regulations or laws are in place which limits your ability to teach science based on your beliefs?

   P: I don't know the numbers as far as the history that of court cases that have come up I've read about them and I know that where that fine line comes in. We're not to teach religion in our classrooms and that's where I think there's a really difficult spot for creation-believing biology teachers that intelligent design is taught different as not being creationism as a theory in of itself and not evolution. The literature comes from the mainstream science powers that be are just trying to link intelligent design to the failed theory, the failed curriculum of creation science. So if they're able to link or say they are the same thing then they can say these laws are again teaching intelligent design when in reality intelligent design is something apart from creation science. From what I see creation science is teaching the biblical account and intelligent design is saying well the evidence presented, there are inferences we can draw, but it doesn't go into any deity or God. You know I think, I lost the question.

I: I think you addressed that well.

10. Have any individuals or organizations ever caused you to feel that you needed to either suppress or teach a lesson with which you were not comfortable?

    P: You know I think when in public school the standards speak for themselves and yes, there are standards that say to show the analogous evidence for evolutionary theory and I've never been comfortable with the standards themselves, so what agency would be responsible for making me feel with the standards when teaching, you know, that portion the standards, it's the whole system and that's where I've come to grips with, they want me to teach it. I'm teaching it. I'll present it to the kids. I can't make them believe if it sounds irrational. If I present the evidence, not that I'm trying to make it sound irrational, but when I put it in light of what of scientific testing and what testing shows us, if we test something, then the kids are like, yes I can really understand that. But when you get into inferences and analogy based evidence for a theory, I think the kids can see through that and I think that has really helped me deal with any pressure that has come from those standards that mandate that I teach the areas of evolution I am not comfortable with, with those areas being specifically macroevolution. I'm fully comfortable with the microevolutionary standards that require me teach stuff that I can observe and see, but that doesn't conflict with my beliefs.

11. Do your personal beliefs affect your relationship with your colleagues within the school?

    P: I think I'm in the exception rather than the rule. From what I've read in research is that there is stark opposition to those who believe in creation science. Now granted I'm in a one district school. I haven't taught anywhere else. I think I'm very fortunate to have those around me who believe similarly, not across the board agreeing, but we don't need to, but I

think the group of individuals I do work with, I can speak for them, that they feel somewhat to the degree I do in speaking with them.

12. What conversations have you had about your beliefs with students, parents, or colleagues outside of school hours?

    P: You know I don't have many conversations with parents on the issue, on this issue of curriculum. Every once in a while I may have student kind of ask me a few questions and we leave the conversation, hey go out there, do your research, take this inquiry further where I can't lead you, but the principle that we learn in science can, so go out and do your research. Leaving them with questions. When I talk with colleagues on the issues, great conversations, very engaging. I look for their opinions, whether they agree with mine or not, but I want to know if they hold these views against creationism, well I like to know what is the one thing tying them down to their current beliefs. Why did they shut the door on creationism? What is it that they can't believe and why? Because it's many of the things there seem more rational than any other alternative.

13. Have you ever attempted to cast doubt on evolution or promote creation?

    P: (Laughter)

    I: Everybody laughs at that question.

    P: Do they really? I think the thing is with science, when you teach science, that's my job. My job is to cast doubt, to scrutinize, to pick apart if you will, ideas that might be "established" theories or ideas currently held. You know we would never be where we are as a human race or society if we just said oh, this is what it should be and don't question it don't pick it apart, don't try to find fault with, because if you do that as a teacher your just telling the kids this is just drill and kill, "This is mutation. This is what happens. And when the test

comes, this is what you answer." I don't think that's building our next generation student that we need. We need these innovative thinkers that are able to think outside the box. Well what is wrong? What if we've been doing this all wrong? So if you can get kids to think and question that in every aspect of their life they're better off so yeah I cast doubt. I cast doubt on the cell theory if it helps then learn. The cell theory being something that is much more concrete than evolutionary theory. But, yes.

APPENDIX L: Focus Group Transcript

I: Would you introduce yourself. If you want to go by first name that's fine and how long you've taught biology and the state where you teach.

S: My name is Shawn. I've been teaching in public education for 7 years, taught biology for 5 or 6 of those years and taught physical science and I teach in the state of SC.

D: Good morning. Darin and I'm relatively a new teacher and have been teaching biology and middle school life science for three years and that's pretty much the entirety of my teaching experience and I'm from California.

I: We pretty much are about as far as we can get. Are there any sources right now because you both believe, you are creation-believing biology teachers? Are there any influences that you are influenced by that you would encourage other biology teachers to check out?

S: The one that I use is used by the churches is by apologetics press, but I don't know if biology teachers outside of a religious standpoint would want to read that type of material.

D: I was thinking I don't quite have a full toolbox of resources, but as a biology teacher, I'm starting to gather a few things and websites that I frequent and they provide me with some background as far as where most creationist scientists stand. One of those is Creation Ministries and the other being the Discover Institute coming from the intelligent design aspect. I look at both of those.

I: Have you seen or are you a member of any of the Facebook groups or creation organization?

D: I think I am. It might have been. I don't remember the names. I'm not on Facebook too often.

S: I am not a member of anything as far as Facebook. I keep up with someone by the name of Brad Harrub. I believe it's through Focus Press.

I: Your state standards. That's one of the things we talked about during the interviews. Is there any particular influence on your state curriculum right now? Is there anything in particular that seems to be driving the biology standards right now?

S: I know in SC where I live, in the upstate there is a very strong religious faith based background of most students and parents and a lot of them are pushing for less factual, less law driven, the idea behind the theory of evolution and more towards teaching it as a theory and bringing in some creation science.

D: With California you talk about two very different sides of the world and sometimes I feel like I'm the only conservative point of view in the state. And I'm in ****** which is more conservative, but what guides the standards, right now CA is in a major flux in accepting the NGSS which I currently am finishing my master's thesis of a review of the new standards as well as the old standards on how they relate to evolution and I've interviewed some teachers and the new standards have an increased focus on evolution and the idea that they are pushing more evolution and they are really not being more specific on evolution, but the idea that they, the topic as well as climate change would be in the new standards and you can see where we're going. There's not a big defense, I guess you would call it on the other side of it. There's no one promoting an alternative curriculum. Parents are not really standing up. I don't really see it in my district.

S: I know at the high school I teach at, I teach at the freshman campus and we have close to 900 freshman and there are 8 teachers and 5 of those 8 teachers believe in creation and they don't believe in the theory of evolution and that says a lot about the school district in which I teach.

I: Do you feel the, in the literature out there, there's a little bit of a debate, even among the evolution believing teachers, do you feel that your state standards are more about understanding evolutionary process or about acceptance?

D: As far as acceptance, my research thesis is focused and if I have to teach evolution which the standards dictate my students to see the aspects of evolution and that's the whole reason for my research question because I wanted to know are teachers trying to teach them the concepts of evolution and that's allowing me to teach the aspects of micro and macro evolution. I don't feel the standards don't state them in CA. The textbooks we use don't use that terminology and sadly I think our standards and the curriculum we're using are just trying to expose them to the idea, not the idea, but the fact of evolution rather than try to teach them the distinctions that exist within the theory itself. But I think that's where CA is and is headed.

S: For SC it's not you have to accept this or you'll be labeled. There are here is the theory of evolution. Here's what evolution teaches us so here's what you should be learning at this point.

I: Do you see, other than the curriculum, any issues facing biology teachers who believe in creation? Do you see anything, what direction this is all going? NSTA? Colleges? What do you see?

S: I know when I was in college if I called it a theory in my biology classes, the professors were pretty harsh with me. They wanted complete 100% acceptance with the theory as a law. Even my science educational classes, they expected me to teach it in that manner. But the demographics of where I teach, if I call it a theory or teach it as a theory or use some sources outside of the textbook that could disprove the theory of evolution I am not frowned upon at all. In fact my principal would back me up on all the facts of the theory of evolution.

D: In my district and my area of CA I think it's less a worry for teacher in my area because you have less people really standing out on the idea. If I were in some other areas of CA I would have to tippy toe around the idea because if a parent were to hear that their student were being told differences or the theory were not like universities want to teach it, that it weren't more fact that theory and it can cause kind of a stir in the district and then cause eyes to be put on you and your classroom and what you are actually teaching. I do feel it is kind of a, and I don't want to say hindrance because the teachers I teach with they do teach the idea that this is a theory and this is one aspect of how you believe and you need to provide evidence for whatever you believe.

I: What misconceptions do you feel your fellow biology teachers have with your view of origins?

S: I don't think I've ever had anyone have an issue with what I've said about creation and evolution. Most of them don't believe in evolution, they believe in 6 days. We're not afraid to say I don't believe in evolution. I believe in evolution. So I don't know from my perspective. I've not had a problem with teachers who believe one way or another.

D: Your last question. I feel like the teachers I work with I don't know how they feel because there is that well does it say it in the standards? Then we don't talk about it. If you do believe in creation I would speculate I might consider that one or two of the teachers I work with which happens to teach the AP class, they probably are more along the lines of not the literal 6 day, but more of a million year type of deal, accepting the time frame of what evolution teaches. But again it's all speculation because we don't have those conversations. I wish we kind of did.

I: Anything, what about the general public, did anybody, parents ever get wind of, oh you're the teacher who believes that? And have something already preconceived in their mind?

S: I have never had any parents come back and question about anything about what I've taught about creation or evolution so no opinion from here.

D: I don't have that experience either within my research I asked a similar question and one of the teachers I work with whom I interviewed did mention one time and he's been teaching for 20 some odd years, there was one time when a parent had that evolution isn't accurate or that there are other theories that might prove evolution so that was interesting that he had certain experiences but it's a drop in the bucket when you get into 20 some odd years of teaching so it's rare I suppose.

I: Do you have any questions for each other as far as the differences in your state or anything you have gone through?

D: You know I have a lot, but uh. Actually, in my credential process. You get your credential year, a little bit about my background I don't have an education degree. My interest are in science so taking the exams to teach science that's what I teach, but I'm moving. Now my credential in CA, but now I'm moving to TX and I know nothing about any other states, educational background, but you hear on the news about Kansas putting up the stir on common core and I don't know where everyone else stands on Next Generation Science Standards, but they should be fully implemented in high school here so I just, I want to know where do other states stand on these standards. I'm not a fan, but I kind of what to know what to expect.

S: I know the state of SC, our district introduced us to these new standards that are coming out so this year and next year we are looking how to implement those into the curriculum. So it's going to be a slow steady process. A transition next year to those new standards.

D: Have you viewed, seen those standards. I know states have the option to kind of tweak their standards to apply to their state. These are standards that are developed from a different organization from which the federal government has said hey lets go with this. I don't know if it's the same things you're looking at that I'm looking at.

S: I have not looked at them enough in detail to make any comments about that. It was here you go look over them. We'll talk about it next year more.

I: Do you have any questions for me about this research? A couple folks had questions after the interview. They wanted to know the whys and the hows about this research. Is there anything you would like to know?

S: What exactly is, this is your dissertation correct? What exactly is it on?

I: The experiences of public school biology teachers who believe in a literal understanding of Genesis creation.

S: I had a similar idea for my dissertation also.

I: It's been good. They push the idea of add something brand new to the body of literature. Something that's never specifically been done. I was interested in that topic, but trying to find that specific niche that hasn't been researched as much before. There's a lot out there about, I keep wanting to say you all because I don't teach high school biology, but I could say we all. But you all are out there in the high school promoting this. There's so much in the literature about how many believe this or somebody who makes the news because they have someone that has their eyes on them. I don't know if saying they went too far is the right word, but they weren't real smart in the way they did things and pushed something loudly and brought in things to their classroom and passed out literature and handing out things and that leaks out and causes a rukus and they make the national media. There were about 3 I contacted and I talked to one of them, but they didn't want to be interviewed. I think they already felt too much heat or were nervous or suspicious. Everybody that's been interviewed. 13 have been interviewed in 8 different states and so many have stories just like what you two have just shared. Is someone else popping up here?

P: I was out pulling out a baby calf. Sorry.

I: Thank you for joining us. Peggy would you tell us where your from and how long you've been teaching.

P: Yes, I'm from originally from ***** and got my degree from University of Michigan in biology and chemistry and got a second degree in mathematics when I moved to Nebraska. I've been teaching I did teach in a public high school biology and calculus for 15 years.

I: We've mostly talked about science and other people's perception so I'm going to let you talk a little bit if you don't mind and if we have any questions we'll jump in and get another conversation going. But as far as the standards in your state, what influences do you see on those standards? Do you see something political or culture? What do you see that's driving biology standards?

P: Good question. I do have kind of the advantage of being raised in Michigan in the ****** area and kind of seeing that education system and then coming out here to central Nebraska, it's way different. The central states, Kansas, Oklahoma, Nebraska are still fairly, they haven't been as influenced I would say. It's infiltrating, we're getting the core curriculum and all that stuff. To answer your question I would say there's a lot in the standards. There's a lot of evolution. There's probably a little bit more of maybe a little bit of ethics which would be more political based type question, but I'd say for the most part I think the state standards are pretty on track with what you need to know for general biology, we're just strictly talking biology right?

I: Yes.

P: I would say there's a little bit of political and cultural influence from the evolution kind of standpoint, but I'd say the majority of the standards here in Nebraska are still going to be just core basic biology type stuff.

I: I forgot to tell you, this is also Shawn from South Carolina and Darin from California so we have east, central, and west.

P: Different perspectives.

I: The perfect distribution. Do Nebraska standards emphasize accepting or simply understanding evolutionary theory?

P: Understanding. I do not think it has totally influenced, that's one of my huge big, I guess, soap boxes right now is the creation vs. evolution debate and fight that's going on everywhere, but I think that in Nebraska. I'm out in the middle of nowhere Nebraska. Down in Lincoln and Omaha in the big cities, my friends that teach science out there are seeing more of the influence, but where I teach out here in central Nebraska, from the school boards, the people that make up the school boards, farmers, ranchers, people who are born and raised out here in the middle of nowhere kind of thing, they are not tolerating it nearly like they are in the bigger cities. There's much more of an infiltration of embracing evolution and you can't even suggest there's any other type of options out there. Where I'm in a unique situation out here. This is still the Bible belt. People still are like, ok, we'll say evolution is a thing if we have to, but we're not going to eliminate all other options and discuss other options so I would say this is still a unique thing in this part of the country.

P: Do either one of you have questions for Peggy after what she just said?

S: Not really. It sounds very familiar to where I am teaching in the upstate of SC.

P: Oh good.

S: In the city of ********. I'm not sure if you know where that is. Outside in the little city of *********, its farmlands and we would be the most conservative part of the state of SC.

P: So you're still seeing that where people are not fully embracing the total rejection of alternatives of evolution, you're still seeing where the conservative view you would say?

S: In our interview earlier a couple weeks ago, I will say things that will question evolution and some of my students will say, Mr. __, why do you keep saying that over and over and another student will say, Because he's talking about God. I can see what he's thinking, I can see him laughing over there in California. Oh, because in my typical classes I would say 75-80% go to some type of religious service on Sunday.

P: Exactly, that's what I see too. And their parents, they are raised that way. They can still think that way and you can still talk that way. So let's hear from the California guy.

D: I'm feeling really alone here.

P: I want to hear it. That's awesome. You're kind of out here on the front line battlefields from the rest of us.

D: You know I mentioned before you had arrived California is, I'm just trying to wrap my head around, I know nothing but CA so I'm trying to wrap my head around where you are really coming from and when we talk about being able to mention anything that might contradict evolution, the best I have is what I'm trying to do, I'm trying to cause all I have to go off of is just evolution and the standards, but because the standards are vague in one area, but if I'm able to teach it, the difference between micro evolution and macroevolution, I think the kids will see, they'll think, Wow, we can actually see micro, we can see that, why do they call it evolution. I think they can see this macro evolution is kind of weird. Where's the evolution. It's an analogy. It looks similar, they act similar, but where is the real evidence. I think when they see that that's what I have to go off of. But as far as if I start bringing in material that mentions intelligent design which is really the next forefront other than creationism, but intelligent design, I think it's

been marked or marred as creationism in a new term and I think that's a miscalculation on I think it's a concerted effort to lump it together because creationism has been so rejected and refuted within courts and what not, but now this intelligent design I think there's a valid point with it and I want kids to be able to use their heads and it's really hard to be stuck behind the standards California is stuck with.

P: Recently I did some research on the theory of its called complexity theory and the theory of spontaneity which are two different theories that have been proposed. Because the Darwinian theory of evolution is just not holding up. If you look at the complexity of blood clotting, the complexity of the immune system, the complexity of the eye that is not supported by Darwinian evolution, the other two proponents that are proposed by scientists one is called the complexity theory and one is called spontaneity or symbiosis where smaller steps, but anyway have either one of you, because those are arguable as well as far as refuting and using scientific evidence and these theories that have been proposed. That's great that's a theory. Here's some serious problems with those theories, because those theories are not based on science either, they are just alternatives to Darwinian evolution. Have you encountered any of those in your teaching at all? Anything other than Darwinian evolution?

S: The one that I encountered was a student talking about aliens planting life here on earth and again because of where I am, we, the entire class had a discussion about that, I was mentioning God and he was mentioning his and we just had a good discussion about that and the class, those who thought they might believe in evolution or those who believed in God they had a good discussion over that. I did not receive any feedback, negative or positive from any parents or administration. And that happens several times every year that I've been teaching.

D: I haven't been teaching long enough to come across, I'm in an environment where any alternative is really pushed. There was a question earlier about as far as whether kids really being taught this to understand or are they just pushing evolution it's there it's kind of a fact and this is what we need to learn and move on. I think kids aren't really using their heads here. There here, their trying to fill their heads with something. We just keep using the term and let's hope that when they get to college they believe their professors to because I'm stuck here, this is bad.

S: The district where I am. The principal says a prayer before faculty meetings. We have prayers before football games. The big district meeting at the beginning of the year, the guy in charge of the district says a prayer so definitely totally different where I teach.

I: There's a question I wish I put on the interviews because as I went along I started wondering what the motivation was for people who agreed to be in this study. At first I was wondering why more people didn't do it, I kind of found out some of those reasons. One guy said it sounds like a lot of work. It's not really that bad, please. But why did you agree to participate in all of this? What was your motivation?

S: Outside of my family and my school stuff, this is what I spend a lot of my time on, reading and studying and preparing sermons for worship is on this and I teach the teenagers this at church also and they're very interested in this topic as well, so about once a year the teenagers at church we'll have some kind of study on this material and what they can do in their Bible, in their school classes to confront the idea of evolution vs. creation. I do a Bible camp during the summer and once every six or seven years we will come back to this idea of creation vs. evolution as a topic or theme for Bible camp. And I was also, I started my doctorate at the

University of SC and this was possibly something I was interested in doing my dissertation on in two years.

P: I agree with Shawn, I am very passionate about the creation vs. evolution thing and with degrees in math and science as you guys are familiar, you've got this very analytical kind of brain and it just really annoys me when people for example if Watson and Crick had presented this information when they came up with their double helix theory with no evidence to back it up, there's was not research, nobody could go and look at their data and confirm it and but then all of a sudden the rest of us are just supposed to accept this information without any, it's just not scientific. Of all the science and math teaching and instruction in education it has to be testable data. You all know the scientific process. You have a hypothesis, you test it, you do some experimentation and you get data and your experiment and your data either confirm your hypothesis or they don't and when they don't you go back to the drawing board and come up with something new. Everything else in science and math is done that way. Every single thing like research that I was studying on cholesterol, research on the double helix, everything else has stuff to support it, evolution does not. It's just everybody is just buying into this and everything to, when Darwin first proposed these theories they had no idea of the complexities of what was going on and the chemical and subatomic particles inside of the cell, they had no idea of these complexities so the more we learn about the ribosomes and the mitochondria and the nucleus and the DNA and the RNA that we're just like oh my goodness there's no way you can explain this by Darwinian evolution. All the gradual step by step, it just doesn't hold up. But nobody's going back to the drawing board. Nobody's saying let's find a different model. There just saying ok let's assume this and move on. And for me to be scientific and it is so not scientific, that's why I agreed to this I get a little riled up, so I'm just like, this is not, I don't get why, I get

why nobody else is riled up, because the logical conclusion that if you don't agree with Darwinian evolution is you've got to, the only other thing its pointing to is intelligent design. Nobody wants to go there because the next thing is there's got to be a God and I don't want there to be a God because I want to be the God. So it's one of my passions too and there's got to be people out there who are telling the other side of the story. That's why I signed up for it.

D: The only reservation I really had about doing this and signing up was that I am so extremely busy with my thesis and I'm trying to get my master's degree, but like everyone else my passion is to confront this topic and I've got the interests of my kids at heart and I want them to use their brains and that's why I picked my thesis, I started teaching three years ago and I observed the standards failed to mention the two factions of evolution and they don't use the terms, I don't how the standards are in your state, but they don't use the terms, micro or macro evolution and I think if I'm forced to teach something these kids need to understand the foundations of it and so I'm really interested to see, this has been encouraging to me, being out here in California, and the one conservative out here in California, this has been really been beneficial to me and I knew I would get some, maybe some support to continue my own research in seeing how teachers teach the theory of evolution as it pertains to those two paths of evolution, because I know I wouldn't get anywhere if I'd made my thesis, do you teach anything else but evolution? If it doesn't hit the standards someone's going to come into your classroom and start asking you, well what are you doing? And I don't want to be that guy on the news like Eric said a minute ago. I wanted I do want to shine the light on other teachers. I want them to take a look at what you teach and why you teach it and the majority of teachers I talk to they all teach evolution in a way that would have students question themselves and then it's out of our hands and then and this is where we need to start researching and this what we want to do as teachers anyway, we can't

teach everything so they have to be driven to search and I think this is a perfect example of how to do that.

I: Anybody have any other questions or anything they would like to say to the group before we depart?

P: It has been nice to meet you guys and I'm sorry I was late. We have a cow that was having a calf and we had to help pull it. So that happens in my life.

D: That's a good excuse.

I: Well thank you very much. I appreciate this. This is very valuable to me. This is my last data collection point so after this I can start breaking things down and analyzing a little bit. And after that comes a lot of writing.

S: Good luck.

P: Good luck.

D: Good luck.

P: Well it was nice meeting you all.

S: It was nice to meet you.

P: It's nice to know there are other people out there doing the same thing.

D: Amen.

I: I appreciate it. Keep up the good work. Bye everyone.

APPENDIX M: Sample Journal Prompt Response

1. How would you respond to a student who directly asked you what you believed?
    a) I would not hesitate to inform him/her that I was a Christian. Creationists and evolutionists are found in all churches.
    b) I would not tell them whether I was a creationist or evolutionist, as my personal belief should not influence what they choose. Our personalities may click or be in conflict, possibly effecting what they accept to learn.
    c) I am not an atheist because of the fact that because something exists means that something had to always be.
    d) I look forward to discussing religion and science with anyone of any belief.
    e) My presentations regarding controversial topics, such as life's origin, age of the earth, and climate change will include evidence and professional interpretations for and against different beliefs. The responsibility is yours to decide what to accept and to be well informed.
2. If you were asked to participate in a local Christian evidence seminar, how would you respond?
    a) I would agree to be a supporter of creationism or evolution.
    b) I almost won a creation/evolution debate a couple of years ago – as an evolutionist!
3. How would you respond to a young, new teacher whom came to you expressing frustration about tension from religious parents over evolutionary content?
    a) You must know evolution better than the typical person. You must know it inside and out. (At least at the general knowledge level) The same for the creation and flood stories of Genesis. Learning standards of the state will include evolution and must be presented

because there will be questions from these on the state and national standardized tests. Teach these standards as well as you can and even better than your colleagues. This means weaknesses and strengths! Knowing strengths and weaknesses actually makes it easier to remember the various aspects of evolution.

b) Encourage "religious parents" to accept the reality of evolution and public school, study creationism or intelligent design for themselves through groups such as AIG, ICR, and The Discovery Institute, and work for change through the political process.