THE EFFECT OF GENDER ON THE ATTITUDES OF UNDERGRADUATES TOWARD YOUNG-EARTH CREATIONISM AFTER ENROLLMENT IN AN ORIGINS COURSE

by

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Liberty University

A Dissertation Presented in Partial Fulfillment Of the Requirements for the Degree Doctor of Education

Liberty University

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ABSTRACT

Many Christian students graduate from secondary schools and enter Christian colleges with worldviews that are unbiblical or contain unbiblical components, many of which stem from their beliefs regarding origins. Little research has been done to study the effect of gender on the role of a young-earth creationist (YEC) origins course in shaping students’ worldview. Research has shown that males and females respond differently to science and religion instruction; because the origins discussion is an intersection of science and religion, the study of gender’s effect in developing a Bible-based worldview is important so that Christian colleges might more effectively guide their students in developing that biblical worldview. The purpose of this causal-comparative study was to determine whether students’ gender affected their YEC worldview components after enrollment in a YEC origins course while controlling for their pre-course worldviews. A sample of 315 residential students enrolled in a YEC origins course at a conservative Christian college in the Southeast completed the Creationist Worldview Scale before and after taking the course; the survey also contained a demographic questionnaire that collected information regarding students’ gender, major, classification, ethnicity, and secondary schooling. The data were analyzed using a one way ANCOVA. There were no statistically significant differences between male and female students’ posttest age scores or posttest science scores, but there was a significant difference between their posttest theology scores. Suggestions for further research are also included.

Keywords: young-earth creationism, creationist worldview, gender and worldview, science and religion
Dedication

This work is dedicated first to my wife, Elizabeth. She is the one who makes all this worthwhile.

This work is dedicated second to Mama. She sacrificed much to give me the chance to succeed.
Acknowledgements

Dr. Kurt Michael, thank you for your leadership in helping me to wrap up this project. You provided encouragement as needed and a firm shove as necessary.

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List of Abbreviations

*Creationist Worldview Scale* (CWS)

*Measure of Acceptance of the Theory of Evolution* (MATE)

Science, technology, engineering, and mathematics (STEM)

Young-earth creationist (YEC)
CHAPTER ONE: INTRODUCTION

Background

Christian students entering college do not have strong biblical worldviews; instead, they are increasingly secular (Valk, 2012). Studies (Barna, 2010; Smithwick, 2008) have shown that, when Christian students leave high school and home to go off to college, they know but do not share the conservative beliefs of their Christian parents. Instead, as Christian students progress through their college years, they often leave further behind the religion education that they obtained while in secondary school (Uecker, Regnerus, & Vaaler, 2007). Because many students attending Christian college have received a non-Christian education through their years in secondary schools, it is reasonable to assume that many students may need help developing a Christian worldview that is unfettered by secular influences. In fact, the same can be said for many students who attended Christian schools because many Christian schools use the same secular textbooks as their public counterparts (Cox, Hamelot, & Talbot, 2007). Even though Christian students may be taught by Christian teachers, Colson and Pearcy (1999) found that simply adding biblical principles to secular lessons was insufficient for providing a truly biblical education.

While college students tend to have low commitments to the religious aspects of worldview when they feel it is forced upon them, they are very open to discussion and persuasion (Guldalian, 2013; Mayhew & Bryant, 2013; Roehling et al., 2011; Twenge, 2006). Young people do not start taking ownership of their beliefs until after leaving high school, and college will either undermine or strengthen the beliefs they have (Carpenter, 2015). In fact, college is one of the last periods of his life that a person is willing to accept worldview-related guidance from anyone else (Brock, 2010; Mayhew & Bryant, 2013; Pascarella & Terenzini,
2005). Because part of a person’s worldview involves his beliefs regarding the origin of the universe and of life, the biblical worldview gained through attendance at a Christian college must address origin-related questions. The study of origins is an intersection of religion and science education, and research (Ferssizidis et al; 2010; Hoffman & Bartkowski, 2008; Mihladiz, Duran, & Dogan, 2011) has shown that males and females respond very differently to these types of education. Because gender has an effect on how students perceive their schooling (Knecht & Ecklund, 2014), it is important to study the effect of gender on Christian students’ worldview after being educated in a young-earth creationist (YEC) origins course.

When Christian students leave secondary school, they often enter Christian college with a weak belief in the authority of Genesis. Because Genesis presents topics that are fundamental to the Bible’s authority, Christians need to know that they can trust what Genesis states. Several studies (Deckard et al, 2003; Deckard & Sobko, 1998; Deckard, DeWitt, & Cargo, 2003; Deckard, Henderson, & Grant, 2002; Henderson, Deckard, & DeWitt, 2003) have shown not only that Christian college students from various types of secondary schools need help developing a stronger belief in Genesis but also that a YEC origins course can help students understand how science supports the Bible and biblical principles. Students in college have perhaps the greatest opportunity of their lives to determine, adjust, and strengthen their beliefs because the collegiate setting provides students with new information from diverse sources that include their college courses, fellow students, and teachers (Arum & Roksa, 2011; Bryant, 2011b). College students must process a vast amount of academic and societal information, a process which ultimately results in the acceptance, rejection, or accommodation of that information; and the importance of these decisions cannot be over-emphasized because the students’ beliefs developed during their college years often determine their worldviews for the
rest of their lives (Pearcey, 2005). Though a student’s life experiences have yielded to him a vast amount of knowledge about the world and its workings, that knowledge is still “full of gaps” that must be filled in or explained by his own worldview (Cordero, 2009). One of the central beliefs guiding this gap-filling worldview is one’s beliefs regarding human origin (Matthews, 2009b; Irzik & Nola, 2009), and young-earth creationism is an application of the Bible to the interpretation of scientific information that declares the origin of humanity (Reiss, 2011).

The modern history of the origins discussion in worldview development goes back at least to 1859 when Darwin published *Origin of Species*. Even before then, society actively separated the sacred from the secular in several areas of life; but especially since the rise of technology and science during the Industrial Age, people also began to separate religion from science (Matthews, 2009b). Before 1859, only a few non-Christian scientists like Charles Lyell and naturalists like Jean-Baptiste Lamarck publicly supported and overtly espoused evolutionary or non-biblical science regarding the origin and sustenance of the universe and life; but most scientists, even non-Christians, saw the orderly nature of the universe and at least recognized the implication of an orderly Creator and Designer. When Darwin published *Origin of Species* in 1859, the tide began to turn in favor of evolutionism; and by the beginning of the 1900s, both the scientific and nonscientific communities had largely accepted evolutionism as a plausible means for the origin and continuance of the universe and life (Kutschera & Niklos, 2004; Morris, 1984).

Bible-believing scientists were slow to respond to the advance of evolutionism, and acceptance moved into Christianity in the form of old-earth creationist theories (Montgomery, 2012; Morris, 1984; Numbers, 2006). The conflict between evolutionism and the Bible culminated in 1925 when the world saw Christians’ ill-prepared response to evolutionists’ attacks against the Bible during the Scopes’ trial, which solidified the perception that religion
and science are distinct concepts (Macdonald, 2004; Marrapodi, 2012). Finally, in 1961, Christians began to turn back toward the literal interpretation of the Bible’s description of “In the beginning” when Whitcomb and Morris (1961) showed in their book *The Genesis Flood* that many evolutionist claims are scientifically impossible. Since 1961, the modern creationist movement has defended the Bible’s authority against evolutionism both scientifically and biblically, and the YEC movement emerged as a global entity (Montgomery, 2012).

Despite the advances in scientific creationism, many Christian young people still maintain, consciously or not, ideas and beliefs that espouse both evolutionism and the separation of religion from science. The primary philosophy driving this separation is the modernist assertion that human reasoning and empirical observations are the only means of truly knowing anything (Kim, McCalman, & Fisher, 2012; Long, 2013). Science is the empirical study of the natural universe, its contents, and its processes; and this empirical study requires experimenting with matter and energy—all of which can be observed physically (Quinn, 2009). As a result, scientists—religious and nonreligious alike—agree that science and scientific procedures cannot be applied to anything that does not have a physical nature of some type; thus, the supernatural or non-material contents of the universe are outside the direct study of science (Aviezer, 2010; Boudry, Blancke, & Braeckman, 2012; NGSS, 2013; Reiss, 2011; Understanding Science, 2013).

However, though science should be treated as science and religion as religion, modernist philosophy requires an absolute separation of the material from the spiritual, of the empirical from the metaphysical, and of reason from faith; in other words, if something cannot be observed empirically, nonreligious scientists demand that it either cannot be known or does not exist (Ayala, 2008; Montgomery, 2012). However, the Bible clearly states that everything physical
was made by a spiritual Creator (John 1:1-3; Hebrews 11:3), and evolutionists still struggle to explain the origin of matter and energy (Belbruno, 2013; Merali, 2013).

Evolutionists take further the separation of religion from science. According to many evolutionists, science and religion are opposing forces rather than merely separate ideas; particularly in the discussion of origins, evolutionists believe that a person is either scientific and evolutionist or is religious and therefore non-scientific (Martin-Hansen, 2008). For example, in a controversial study, evolutionists Lawson and Worsnop (1992) tried to show that, when students in an evolutionist biology course were presented with information contrary to their initial opinions, students with higher-order reflective thinking skills would be more likely to change their religious beliefs than those students who did not have higher-order reflective thinking skills. Despite their instrument's extremely low reliability, Lawson and Worsnop concluded that students who could think scientifically would reject religious ideals and that students who maintained a belief in creationism did not have higher-order reflective thinking skills. In other words, Lawson and Worsnop concluded that creationist students who retained their creationist beliefs were not as intelligent as those students who rejected creationism in favor of evolutionism. Like Lawson and Worsnop, many evolutionist researchers support the idea that non-evolutionists are also non-scientific, a belief which is evidenced by the hundreds of favorable citations (Google Scholar, 2015) of the Lawson-Worsnop article.

Several creationist studies (Deckard, DeWitt, & Cargo, 2003; Deckard & Sobko, 1998; Henderson, Deckard, & DeWitt, 2003) have also been done, showing that instruction in YEC origins has positively affected students’ biblical worldviews. However, though additional research has been done regarding the effect of students’ secondary schooling (Deckard et al.,
2003) and the effect of the teacher’s worldview (Deckard, Henderson, & Grant, 2002), no research has shown the effect of student gender on the reception of YEC origins information.

According to Gurian’s (2011) gender theory, males and females have inherent differences in their brain structures and chemistry that occur due to the same biological processes that determine their sex; and further, the brain differences also cause males to learn and behave differently from females. According to a literal interpretation, the Bible states that males and females are different because God made them distinct from each other, assigned them different roles, and made them to complement each other (Genesis 1:27; 2:18; Ephesians 5:22-28; CBMW, 2012; Knecht & Ecklund, 2014; Whitehead, 2014); and Gurian’s gender theory is therefore consistent with the Bible: a person’s gender is directly linked to that person’s sex. Because males and females learn differently, Gurian’s gender theory supports the biblical distinction between males and females and may play an important role in studying worldview development.

Sire’s (2009) worldview theory states that one’s worldview determines the further development of his worldview. Worldview develops out of a person’s experiences, knowledge, and beliefs; and one’s worldview guides his behavior, his interactions with others, and his reactions to the world of people around him (Mayhew & Bryant, 2013; Sire, 2009; Valk et al., 2011; Vidal, 2012). Therefore, worldview theory states that a person’s worldview determines how he will interpret information and how he will accommodate that information to further shape his worldview (Sire, 2009). By the time they graduate from secondary school, young people have gained a vast amount of information from and interaction with the world of people around them; and college students in particular have a final opportunity to gain knowledge and develop beliefs that will influence their perceptions of life experiences for the remainder of their
lives (Brock, 2010; Mayhew & Bryant, 2013; Pascarella & Terenzini, 2005). Part of the worldview discourse must therefore include a discussion regarding the extent to which one’s gender affects the development of worldview.

The intersection of worldview theory and gender theory is apparent in the study of worldview development. According to Bandura (1986) and Vygotsky (1978), children take on the gender roles that they observe being filled by the like gender, and these observations and related experiences shape their worldview as they grow older. Bem (1981) also noted that children’s gendered view of STEM (science, technology, engineering, and mathematics) careers was in many ways a response to the opinions they observed in adults, and she found that young females tended to reject STEM careers in large part because they observed older females’ disinterest in or outright dislike of those careers.

Much educational research involves a study of gender; and because the origins discussion involves science and religion topics that tend to distinguish males from females, the study of origins worldview would be incomplete without addressing gender effects as well. Because research has shown that males and females respond differently to science education and religion education (Hoffman & Bartkowski, 2008; Kenway & Gough, 1998; Mihladiz, Duran, & Dogan, 2011), the science and religion topics intrinsic to any origins course may be perceived differently by male and female students.

**Problem Statement**

Current college students have faced many more sources of conflicting worldview information than did their parents when preparing for college, and students’ years at college provide a platform for college students to form their own worldviews, separate from many of the sources that influenced their worldview development thus far (Mayhew, Bowman, &
As students gain more knowledge and experience, many realize that they have more questions than can be answered by the physical world, and they begin to seek answers via “religious reinforcement” in the classroom (Bryant, 2011b). Students seeking answers need a solid worldview education in order to effectively live out their beliefs (Valk, 2012); however, studies (Quinn, Foote, & Williams, 2012; Zigarelli, 2012) have shown that educators at universities and colleges generally lack a clear or obvious method of incorporating biblical worldview into their courses, which is a situation that may be especially problematic at a Christian college. Because biblical worldview development is a foundational part of any student’s attendance at a Christian college and because one’s belief in origins affects a large part of that worldview (Hermann, 2013; Knecht & Ecklund, 2014; Mayhew, Bowman, & Rockenbach, 2014; Valk, 2012), the extent to which a student’s worldview is affected by enrollment in a creationist origins course must be researched. Though Deckard, DeWitt, and Pantana (2008) tested the effect of a YEC origins course on worldview, they did not address the relationship between the students’ genders and their worldview. Christian institutions have the burden to develop their students’ worldview according to biblical principles (Cox, 2014; Zigarelli, 2012); and in the context of this study, these Christian institutions need to know how best to do so in an origins course. The problem is that there is little literature regarding the effect of gender on Christian college students’ worldview after taking an origins course presented through a YEC worldview (Knecht & Ecklund, 2014).

**Purpose Statement**

The purpose of this causal-comparative study is to test Gurian’s (2010, 2011) gender theory that males and females respond differently to worldview education as it relates to students’ YEC worldview development due to their enrollment in a YEC origins course at a
Christian college located in the Southeast. The independent variable \textit{gender} is defined by the two categories \textit{male} and \textit{female}. Three dependent variables will be explored: \textit{posttest age score}, \textit{posttest science score}, and \textit{posttest theology score}. The dependent variable \textit{posttest age score} distinguishes old-earth creationists from young-earth creationists; the dependent variable \textit{posttest science score} distinguishes those who interpret scientific facts according to biblical principles from those who do not; and the dependent variable \textit{posttest theology score} measures respondents’ adherence to the major doctrines of the Bible (Henderson, Deckard, & DeWitt, 2003). The covariates are the pretest scores obtained on the \textit{age}, \textit{science}, and \textit{theology} subscale portions of the \textit{Creationist Worldview Scale}.

\textbf{Significance of the Study}

The world has been turning toward secularism for decades, and secularism has been rising up in Christianity (Scherer, 2011) because Christians are leaving behind their faith in the Bible (Barna, 2009). For many Christian students attending college, the accommodation of secularism began in their public schools because the students were exposed to rampant secularist ideals. Other Christian students were exposed to secularist principles in their Christian schools because the Christian schools used secular textbooks instead of Christian textbooks that presented a straightforward biblical worldview (Cox, Hameloth, & Talbot, 2007). Christian Millennial students in particular do not accept answers when a religious authority simply states “Because the Bible says so,”—much less when the authority says “Because I said so” (Gudalian, 2013). Further, Christian Millennial students are increasingly secularized because, in comparison to their parents or even older Millennials, fewer Christians are attending church (Gudalian, 2013), fewer Christians support a literal interpretation of Genesis (Smith, 2012; Southcott & Downie, 2012), and fewer Christians are practicing basic religious activities (Barna,
As Christian institutions work to meet their biblical burden of training young people to minister in today’s increasingly secularized world, perhaps the most important part of that training involves providing a clear, biblical worldview as the foundation for the students’ lives and ministries. A large part of that biblical worldview depends on the students’ view of human origin, and only a biblical view of human origin will develop a biblical worldview (Deckard, Henderson, & Grant, 2002).

One of the best times to develop a biblical worldview is during one’s college years because students are young enough to have malleable worldviews and yet are also experienced enough to think through conflicting information (Holmes, Roedder, & Flowers, 2004). Developing a biblical worldview in college will assist students in being the salt and light Jesus Christ has called them to be when they are “on their own” (Proverbs 22:6; Matthew 5:13-16; Hunter, 2008). Part of the goal of Christian college is to prepare students to answer the questions posed by the world (1 Peter 3:15), and one of the most important questions involves the Bible’s authority in all areas, particularly the origin of the universe and of life. As Barnes, Alberstadt, and Keilhoitz (2009) showed, creationist students are not anti-science; but as several other studies (Deckard et al., 2003; Deckard, DeWitt, & Pantana, 2008; Henderson, Deckard, & DeWitt, 2003) have also shown, students need the training gained in a YEC origins course in order to learn how to interpret scientific information through a biblical lens to avoid simply stating “Because the Bible says so” to those who ask for a reason. Because evolutionists sometimes use misinterpreted scientific facts to question the Bible’s authority by disputing Genesis, students can readily answer those disputation by appropriately interpreting the science in a way that accurately, honestly, and obviously supports the Bible.
The significance of this study is multi-faceted. First, this study will add to the current body of knowledge by determining whether there exists a gendered adherence to YEC principles and ideals gained in a YEC origins course. Second, this study will add to the current body of knowledge by determining whether there exists a gendered attitude toward creationist studies as either a religious or scientific study. Third, the results of this study will aid origins instructors in presenting YEC information in a way that more efficiently reaches students of both genders so that these students can stand firm in their faith and present that faith to others.

**Research Questions**

The research questions for this study are:

**RQ1:** Is there a difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest age scores*?

**RQ2:** Is there a difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest science scores*?

**RQ3:** Is there a difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest theology scores*?

**Null Hypotheses**

The null hypotheses for this study are:

**H₀₁:** There is no statistically significant difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest age scores*. 
**H₀2:** There is no statistically significant difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest science scores*.

**H₀3:** There is no statistically significant difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest theology scores*.

**Definitions**

1. *Attitudes* - an evaluation of a psychological object that ranges from positive to negative (Eagly & Chaiken, 2007; Petty, Brinol, & DeMarree, 2007; Petty, Wegener, & Fabrigar, 1997).

2. *Evolutionism* - a view of science based on uniformitarianism that states the universe and its contents evolved according to naturalistic processes over about billions of years (Mayr, 2001; Nei, 2013).

3. *Gender* - a biological difference between males and females as a result of differences in brain structure and brain chemistry (Gurian, 2010, 2011)

4. *Old-earth creationism* (OEC) - a view of science based on evolution that interprets the Bible allegorically in regard to the creation week (Harlow, 2008, 2010; Hefner, 2012; O'Brien & Harris, 2012).

5. *Worldview* - a way of thinking and behaving based on one’s knowledge, beliefs, and experiences (Coletto, 2012; Sire, 2009).

6. *Age score* - a subscale score of the CWS that distinguishes old-earth creationists from young-earth creationists (Henderson, Deckard, & DeWitt, 2003).
7. **Science score** - a subscale score of the CWS that distinguishes those who interpret scientific facts according to biblical principles from those who do not (Henderson, Deckard, & DeWitt, 2003).

8. **Theology score** - a subscale score of the *Creationist Worldview Scale* (CWS) that measures respondents’ adherence to the major doctrines of the Bible (Henderson, Deckard, & DeWitt, 2003).

9. **Young-earth creationism** (YEC) - a view of science based on the Bible that states the universe and its contents were created in six literal days about 10,000 years ago (Deckard, DeWitt, & Pantana, 2008; Pennock, 2003).
CHAPTER TWO: LITERATURE REVIEW

Introduction

The extensive literature regarding origins includes more than discussions about how the universe began, either through evolution or special creation by God. Instead, origins discussions involve beliefs that not only affect how people interpret scientific data but also how people interpret and respond to world events, other people’s actions and words, and their own behavior and responsibilities. The discussions about scientific and interpersonal interpretations lead to a discussion of worldview, which represents a vast body of literature that requires a considerable amount of winnowing in order to focus on the aspects related to this study. Because the current literature presents the origins discussion as a foundation for worldview, the primary portions of this chapter will present the theoretical research of worldview theory, gender theory, a survey of creationism, and a discussion of the creationist instrument that measures the origins component of worldview.

Worldview Theory

The worldview a college student has at graduation will guide him for the rest of his life. Two of the primary factors shaping that worldview are the student’s belief about himself and the relationships he has with others, both of which are developed out of his view of the world in general. Because educators have a prominent role in college students’ worldview development, it is necessary that educators periodically gauge the worldviews that students have when they enter worldview-related courses so that educators can present information that appropriately guides the students’ worldview development.

One’s beliefs about the origin of human life sets the stage for his view of himself and his relationships with others. While evolutionism states that humans evolved from lower life forms
through random and purposeless processes, creationism states that an orderly God created humans for the purpose of having a relationship with Him. These two origin stories are vastly different, and they produce vastly different views of one’s self and of others. Belief in either evolutionism or creationism also affects how a person interprets his place and responsibilities in the world and then behaves accordingly. As people gain experience through life events, their different views of the world affect their interpretations differently, which in turn affects how they accommodate new information and experiences that further affect their views of themselves and of others. Thus, one’s belief regarding the origination of human life has a direct bearing on how one’s view of the world is shaped over the years of his life. In other words, one’s current worldview guides future changes in that worldview. Understanding the effect of origins information on college students’ worldviews requires knowing what their worldviews are and what effect those worldviews have on the students’ willingness to further shape or hone their worldviews.

In the context of this study, college students are primed to set their worldviews as a foundation for the remainder of their lives. This study will gauge the worldviews of Christian college students before taking a YEC origins course, observe the change in the college students’ worldview due to the course, and compare the students’ worldviews before the course and their worldviews after the course. Toward that end, worldview literature has been categorized into the definition of worldview, origination of worldview, importance of worldview, development of worldview, and measurement of worldview.

**Defining worldview**

In order to study worldview, one must begin with a definition of *worldview* (Koltko-Rivera, 2004), and the definition will vary based on the definer’s worldview (Sire, 2009). The
definition of worldview has developed out of Kant’s original use of the word *Weltanschauung*, to simply mean one’s view of the world (Naugle, 2002), into definitions as general as Kuyper’s (1898) “life system” and as specific as Sire’s (2004, 2009) “the orientation of the heart.” The vast amount of worldview literature presents an overwhelming number of definitions, each framed according to the authors’ worldviews. Depending on the context surrounding the discussion of worldview, these definitions can be generally categorized either as a way of thinking or as a way of living out beliefs; and both categories can then be applied within various academic, social, and philosophical contexts (Marshall, Griffeon, & Mouw, 1989).

As a way of thinking, worldview definitions address man’s reasoning, his comparison of what is happening to what he believes should happen next. Gauch (2009) defined worldview simply as an individual’s way of making his own decisions. Naugle (2002) also defined worldview from an individualistic point of view, stating that worldview is “that mental medium by which the world is known” (p. 330); and both Ho (1995) and Treviño (1996) further stated that worldview could be defined as a way of making sense of one’s own life. While retaining the reasoning aspect of worldview, Cordero (2009) expanded worldview from the individual to a much wider application: the effect on society; Cordero defined worldview as one’s “comprehensive picture of the world” (p. 748), the way a person interprets his place in the world and his relationship to the other people he interacts with. Grauf-Grounds et al. (2009) defined worldview as a way of knowing how to act, whether that action occurs when a person is alone or among others. Almost disregarding the individual’s thoughts about himself, Koltko-Rivera (2004) and Ochs (2009) stated that one’s worldview was defined by how that person has enhanced or added to society. Whether defined from the individual’s perspective or from the perspective of wider society, these definitions concentrate on how a person thinks; but these
definitions do not address why a person thinks the way he does, and these definitions are therefore inadequate for a deeper study of worldview.

While worldview can be defined as a way of thinking, worldview is better defined as a way of living out beliefs. Definitions of worldview that separate thinking and living out beliefs are inadequate because such definitions leave out the connections between how one thinks and how he arrives at those thoughts. In this context, Marshall, Griffeon, and Mouw (1989) defined worldview as a framework of beliefs that interprets experiences and then provides the possible reactions to those experiences. Addressing the depth of one’s beliefs, Sire defined worldview as a layering of values within one’s consciousness, which acts like a sieve to sort thoughts and experiences (2004). Supporting Sire’s emphasis of value, Coletto (2012) defined worldview as a paradigm described by one’s fundamental convictions and attitudes—not just a way of thinking, but a way of thinking because of what one believes. In his book *The Universe Next Door*, Sire (2009) combined and summarized the definitions above by defining worldview as

> a commitment, a fundamental orientation of the heart, that can be expressed as a story or in a set of presuppositions (assumptions which may be true, partially true or entirely false) that we hold (consciously or subconsciously, consistently or inconsistently) about the basic constitution of reality, and that provides the foundation on which we live and move and have our being (p. 20).

Sire’s definition of worldview is appropriate for deeper worldview studies because it addresses not only the reasoning of a person’s worldview but also the reasoning behind a person’s worldview—a reasoning based on beliefs.

**Worldview origination**

As a way of living out beliefs, worldview is the way a person compares the world against some standard and then reacts to that comparison. Sire (2009) stated that worldview was the expression of presuppositions that provide the foundation for one’s life, and Magee and
Kalyanaraman (2009) stated that worldviews are those core beliefs or *a priori* assumptions that help people to decipher the world. Thus, worldview is the way one compares the world to some set of presuppositions as the standard. The question is, where those presuppositions come from. In the context of college students, the answer to this question can be as simple as a discussion of family or as involved as a discussion of philosophy.

When most young people enter college, they have inherited their worldviews from their near society. Young people’s worldviews have been shaped primarily by their cultural community of family, peers, and local authority figures such as teachers and their friends’ parents (Deckard, Henderson, & Grant, 2002; Grauf-Grounds et al., 2009; MacDonald, 2004). Bandura’s (1986) theory of observational learning describes children’s tendencies to learn social norms and customs based on their observation of parents, older siblings, neighbors, and teachers. In fact, the effect of community can be so influential that Olivier (2012) defined several different worldviews based on the differences in the cultural foundations that held each worldview. Though Kim, McCalman, and Fisher (2012) did not place the same emphasis on culture and community, they did find that different worldviews have a unifying and unique philosophical or religious foundation that they called an “ultimate principle or premise” (p. 206). DeWitt (2007) agreed, using the German *zeitgeist* to describe the common worldview or “spirit of the age” shared by a group of people. A person’s ultimate premise or *zeitgeist* is the beginning of how that person learns to think, to interpret the way the world works, and to live accordingly. Considered altogether, this tendency of gaining worldview from community implies that when students leave high school and enter college, they interpret the world the way their community interpreted the world because that is what they are accustomed to—not because they have ever actually thought through their interpretation processes to determine their validity (Forray &
Woodilla, 2009; Pearcey, 2005). Instead of being a personally-held set of beliefs, worldview becomes a “plausibility structure,” a network of beliefs that are held so firmly by the community that they are not questioned by the members of that community (Sire, 2004). Sharing common values with the community has its benefits, but conflict is sure to arise when individuals find contradiction within the community’s worldview or when the individual’s worldview differs from the community’s worldview (Treviño, 1996).

When college students graduate, they are “out on their own,” and they need to think for themselves. One of the fundamental purposes of higher education is to prepare students to live in, thrive in, and contribute to the larger world they will become a part of (Brock, 2010; Bryant, 2011a). Before college, students live in a relatively small world that was bounded by their parents, friends, school, and relatively small communities. Though even high school students are exposed to different worldviews through experiences at school or near home, when these students enter college, they begin the process of leaving behind their small worlds and entering into a much larger and more diverse society where the worldview differences are deeper and broader than ever before (Pearcey, 2005; Valk et al., 2011). As this exposure tests the students’ knowledge of and commitment to their own worldviews (Mayhew & Bryant, 2013), it causes them to think critically about their beliefs, a process which leads students to consider their personal philosophies and compare them to the philosophies and beliefs held by others.

Philosophy and worldview are related, but they are not the same. The philosophy-worldview relationship can be thought of in several ways. From an individual’s perspective, philosophy is a fusion of presuppositions about life, and worldview expresses those presuppositions as thought and action. Worldview is therefore a philosophy-based assessment of the world and a philosophy-driven reaction to that assessment (Vidal, 2012; DeWitt, 2007; Sire,
In a societal sense, philosophy is one's basic understanding of life due to one’s knowledge, beliefs, and experiences; and worldview guides one’s interpretation of the world according to community interactions and then dictates corresponding reactions. In application, people within the same society can have similar philosophies, but their different experiences, knowledge, and beliefs will produce different worldviews, which is one of the reasons an individual can find conflict within his community’s plausibility structure. Last, philosophy can be viewed strictly as a framework built from a perception of reality, knowledge, and value (metaphysics, epistemology, and axiology); and worldview then is a construct of applied philosophical presuppositions that are accepted with reasons—based on experience, knowledge, and beliefs—but not proof (Sire, 2009).

Regardless of how one considers the philosophy-worldview relationship, philosophy is a foundational understanding of life that supports worldview, a construct that is one’s interpretation of how the world works and one’s corresponding decisions to act accordingly. Because actions lead to subsequent interpretations and reactions, worldview also guides the further development of one’s worldview; as such, worldview can be understood simply as the framework for building one’s life based upon one’s philosophy. Therefore, if philosophy is a basic understanding of life, then worldview is a way of living out that understanding.

Whether addressed as the community’s belief or an individual’s philosophy, one of the foundational components of worldview is one’s belief in the origin of human life. Human origin is understood within the philosophical study of ontology, the study of existence; and ontology affects worldview because one’s belief in how mankind originated will determine to a large extent how one views himself and the place of those other people who operate within the world around him (DeWitt, 2007; Sire, 2004). One’s worldview will affect the extent to which a
person is willing to change his worldview through interactions, insight, or new knowledge; and when a Christian college student is presented with information about human origins that contradicts or reinforces his presuppositions, the student’s worldview will determine the extent to which a corresponding change might occur in how he views himself and the rest of the world—again, his current worldview will determine how his worldview changes.

**Importance of worldview**

Just as a community’s worldview shapes the worldview of a young community member, so does the collective worldview of individuals shape the worldview of a society. Because the individuals’ worldviews can contain conflicting ideas (Deckard, DeWitt, & Pantana, 2008; Sire, 2004; Sire, 2009; Treviño, 1996; Valk et al., 2011), the community may also experience conflict. Because many of these conflicting ideas can come from leaders, teachers, or other authoritative figures who hold different worldviews (Deckard, Henderson, & Grant, 2002; Grauf-Grounds et al., 2009; MacDonald, 2004), the community is strongest and most supportive when its members and its leaders have worldviews that are appropriately developed and can therefore prevent conflict between what one believes and how one lives out those beliefs (Sire, 2004). Especially when the conflict between believing something and living it exists within religious or spiritual worldviews, inconsistency between thought and action will ultimately lead to an unfulfilled life and to discord with others (Richards & Bergin, 2005; Schilders et al., 2009; Sire 2009; Kim, McCalman, & Fisher, 2012). Because worldview directs one’s search for answers to life’s questions, worldview provides a framework for how people answer those life questions and then determines the satisfaction they have in the answers they find. Therefore, being a leader within a community starts with knowing what is one’s own worldview and then living accordingly—or
knowing one’s beliefs and then living out those beliefs (Sire, 2009; Grauf-Grounds, et al., 2009; Valk et al., 2011).

The Lord Jesus called His followers to be the salt and light of the world. Salt acts as a preservative to hold back corruption, and light displaces darkness. If Christian colleges are to fulfill their duty of preparing graduates to be Christian leaders of their communities, Christian college students must be taught the biblical worldview. Part of living a successful Christian life involves knowing and developing one’s own worldview because that worldview guides thinking, and people who cannot think for themselves will be subject to the thinking of others. If college graduates merely accept their society’s plausibility structure, then they will not prove for themselves whether their worldview is correct (Sire, 2004). Conversely, when society holds a worldview that they believe needs no further proof, they can easily wonder why someone without that same worldview needs proof—in the mind of society, their worldview is already proven. As Mayhew and Bryant (2013) found, there is, then, a type of peer pressure applied by the society: the individual feels inclined to believe what his society believes without proof or evidence, and the opportunity to lead is lost. This loss of leadership opportunity suggests that, with the current downward trend in biblical literacy (Barna, 2009) and in the absence of biblical training (Marrapodi, 2012), many Christian young people will readily accept one of many unbiblical worldviews in order to agree with the rest of their society (Hunter, 2008)—as an example, many lay people and scientists readily accept evolutionism without evidence or proof. While agreement with one’s society generally leads to comfortable living, scholars, educators, and researchers agree that critical thinking skills are important parts of a person’s development (Astin, Astin, & Lindholm, 2011; Mayhew & Bryant, 2013; Vidal, 2012); in other words, college
students need to think through their worldviews critically in order to develop a worldview that will enable them to lead—and to lead successfully.

**Developing worldview**

Everyone has a worldview, but not everyone can articulate that worldview (Magee & Kalyanaraman, 2009; Sire, 2009; Valk et al., 2011). Many parts of a person’s worldview are unconscious, meaning that people are not immediately aware of worldview application to a given situation, whether for the good or the bad (MacDonald, 2004; Vidal, 2012). One of the most significant, yet almost unconscious, parts of a person’s worldview involves what one believes about the origin of human life (Deckard et al. 2003; Deckard, DeWitt, & Pantana, 2008; DeWitt, 2007)—a belief that is significant because one’s belief about himself guides his actions and reactions toward others, but unconscious because few people consider the purpose that their origin bestows on them. Naugle (2002) said that worldview is a systematic way of looking at the world, but few people know what their system is or what it is founded on. According to Treviño (1996), the internal conflict caused by inconsistencies within one’s own worldview is a leading cause for people to seek counseling: they know their lives are not fulfilled, but they do not know why.

People’s willingness to change their worldviews waxes and wanes throughout their lives, and the last major “peak” of willingness occurs during college years. It may be an obvious statement that people’s worldviews develop and mature over time as they are affected by experiences, culture, and knowledge (Koltko-Rivera, 2004; Valk et al., 2011); what is not as obvious, however, is the plateau effect as children mature into young adults. At several points in their development, young people readily adopt changes in their thinking; yet at other points, they almost refuse changes outright. In fact, Boldrin and Mason (2009) found that the farther young
people progressed through their teenage years, the more likely they were to hold on to their beliefs and resist changing what they thought—or to make only minor changes—regardless of the evidence presented against their positions, even when the adolescents admitted the evidence was valid. This resistance to worldview change was also seen in and supported by a study of personality development (Vidal, 2012). Using the five factor theory (FFT or Big 5) developed by McCrae and Costa (1999), Mervielde and De Fruyt (1999) showed that personality was also entrenched by the time an adolescent reached his older teenage years. Because personality is an extension of worldview (Boeve-de Pauw, Donche, & Petegem, 2011; Koltko-Rivera, 2004), Mervielde and De Fruyt’s study supported the Boldrin and Mason (2009) claim that worldviews are not easily changed once adolescents leave their teenage years. However, after young adults enter college, they are again quite open to changes in their thinking and worldview. In fact, Brock (2010) found that, after four semesters of college courses, college students are the most likely to reflect critically over what they know and then make changes in their thinking based on what they have learned. Also, Pascarella and Terenzini (2005) and Mayhew and Bryant (2013) found that young people began their final process of refining their worldview values and integrating these values into their thinking and lifestyles during their college years. This strongly suggests that one of the last opportunities to effect changes in a person’s worldview is during his college years, and teachers have a responsibility to address the worldview issues that students have (Deckard, Henderson, & Grant, 2002; Irzik & Nola, 2009; Schilders et al., 2009).

One of the key factors affecting worldview development is a student’s education (Francis & Greer, 1999; Matthews, 2009c). Evolutionists (Barnes, Alberstadt, & Keilholtz, 2009; Schilders et al., 2009) and creationists (Deckard et al., 2003; Henderson, Deckard, & DeWitt, 2003) agree that teachers are among the most influential voices that a college student heeds when
deciding what to believe and how to interpret the world. Any individual’s description or
discussion of worldview is biased unless it is based upon an objective standard. In the case of
the biblical worldview, that standard is the Bible; and the biblical worldview is therefore an
objective worldview. Because a biblical worldview is best explained by a Christian who knows
what the biblical worldview is (Sire, 2009), Christians who teach college students have the
responsibility to address students’ worldview questions, especially because college students are
willing to ask questions, listen to answers, and then change their thinking. According to Bryant’s
(2010) study of about 15,000 students in 136 colleges and universities and according to Mayhew
and Bryant’s (2013) study of over 1,000 students at two colleges, religious students are more
affected than nonreligious students by their experiences at a either a religious or a secular
institution. Though this response does not suggest that religious students are more positively
affected at a religious institution than at a secular institution, it does suggest quite strongly that
education with a religious worldview significantly affects the worldview of religious students,
which further suggests that students with a religious worldview are more open to and accepting
of further development of their worldviews (Deckard, Henderson, & Grant, 2002; Schilders,
2009). In fact, while evolutionists depend on biology teachers to present evolutionism to
students in such a way that students not only learn what they are taught but also believe it (Long,
2012; Moore, Brooks, & Cotner, 2011; Rice, Olson, & Colbert, 2011), Deckard, DeWitt, and
Pantana (2008) found that an origins course taught by creationists had a greater effect in
changing students’ worldview than did corresponding biology courses.

College students need to think critically in order to know and develop their worldviews.
In the book Naming the Elephant (2004) and in the first four editions of The Universe Next Door,
Sire asked seven questions, the answers to which help a person to think critically through his
beliefs and to determine his own worldview. In the fifth edition of *The Universe Next Door* (2009), Sire added an eighth question to further stimulate critical thinking. Ochs (2009) asked nine questions that readers must answer in order to know their worldview. Answering these questions is important, not necessarily so that anyone is surprised to finally discover what his worldview is, but so that, in knowing one’s own worldview, a person can live a more satisfied life through consistent and corresponding actions (Grauf-Grounds, 2009; Ochs, 2009). In the religious context, Christians should know their worldview as a matter of ministry: Christians can explain their worldviews to those who ask, help those who are struggling with their own worldviews, and understand better those with different worldviews when they minister to them.

When banks train new employees to recognize counterfeit bills, the employees are first given true bills to handle, and they are later given counterfeit bills so that they can make comparisons. Under this training, the new tellers become so accustomed to the look and feel of a true bill that they can recognize counterfeit bills by making some simple comparisons (1st Financial Training, 2010). So it must be with Christian students: they must be so familiar with a biblical worldview that they can recognize an unbiblical worldview by making just a few simple comparisons, even if the students are not very familiar with the unbiblical worldviews in question.

**Measuring worldview**

Measuring worldview is both possible and necessary. If the exhibition of worldview is measurable, then the worldview construct is also measurable. As noted above, one of the ways worldview manifests is through responses toward the rest of the world, and this response is often characterized as attitude (Petty, Briñol, & DeMarree, 2007). Worldview is developed over the course of a person’s early life, and it guides him through the rest of his life. From a biblical standpoint, then, it is imperative that Christians in authority positions know, or measure, the
worldviews of their young people so that the worldviews can be developed according to biblical principles.

**Using a narrow context.** Measuring worldview is an important process because the differences between and the contents of people’s worldviews highlight their beliefs about God and the nature of man (Deckard, Henderson, & Grant, 2002; Sire, 2009). Because the accurate measurement of worldview is important, the worldview under study must be narrowly defined due to both the difficulty in defining worldview and the conflicts that people’s worldviews contain. However, despite the obvious and wide ranging effects of people’s worldviews, the concept of worldview is often abstract rather than concrete because worldviews involve a wide spectrum of development and application, including religion, ideology, politics, and philosophy (Cordero, 2009; Irzik & Nola, 2009; Kim, McCalman, & Fisher, 2012; Olivier, 2012). Thus, studies involving worldview are best explored within a narrow context, consisting of either a single worldview (Aerts et al., 2007; Kim, Fisher, & McCalman, 2009) or several mainstream worldviews holding similar beliefs (Biviano, 2012).

Once a worldview has been identified and narrowly defined, it can be measured (Deckard, Henderson, & Grant, 2002; Forray & Woodilla, 2009; Olivier, 2012). However, worldview is a complex construct, and adequately measuring worldview can be just as complex (Aerts et al., 2007; Deckard, DeWitt, & Pantana, 2008; Deckard, Henderson, & Grant, 2002); and this complexity is especially significant in instances where one’s knowledge may conflict with one’s belief (Boldrin & Mason, 2009). Though some evolutionist studies (Barnes, Alberstadt, & Keilholtz, 2009; Lawson & Worsnop, 1998) seem to equate the knowledge of evolutionist ideas to their acceptance, many researchers agree that accurate measurement of worldview requires more than an objective test of factual knowledge (Deckard, 2014; Forray &
Woodilla, 2009; Nassar-McMillan et al., 2010; Vidal 2012). Therefore, having a creationist or evolutionist worldview is different from having an extensive knowledge of creationism or evolutionism. For instance, a student with a high degree of knowledge about evolutionary ideas may not have a corresponding high degree of belief in evolutionism (Moore, Brooks, & Cotner, 2011). Because worldviews are evidenced more through behavior, language, and opinions than through mere knowledge (Grauf-Grounds et al., 2009), to address the difference between knowledge and belief, many researchers advocate the use of psychometric measures such as attitudes, beliefs, or levels of agreement to determine worldview (Boldrin & Mason, 2009; Bryant, 2011a; Kim, Nesselroade, & McCullough, 2009; Paunonen & O’Neill, 2010).

Attitude as a measure of worldview. The consensus among researchers is that an attitude is the result of someone’s personal evaluation or a comparison of one thing to a standard. Bohner and Dickel (2011) defined attitude as “an evaluation of an object of thought,” where that object was identified as “anything a person may hold in mind” (p. 392). Not only does attitude require an evaluation, it also implies a comparison based on personal experiences because all attitudes have a dimension of good or bad. Ajzen (2001) stated that, not only is an attitude a “summary evaluation of a psychological object,” but Ajzen also stated that each evaluation had a positive/negative dimension (p. 28). Eagly and Chaiken (2007) supported these two ideas and broadened the definition by stating that attitude is a “psychological tendency” of labeling evaluated objects with positive or negative descriptors (p. 598).

A key feature of attitude study is the stability or strength of an attitude. When people take the time to think about their evaluation of something, their attitudes are fairly consistent; that is, their attitudes are stable or strong. Schwarz (2007) showed that, once created and stored in long-term memory, attitudes tend to remain constant despite changing circumstances. The
difference between weak, on-the-spot attitudes and strong attitudes is one’s ability to evaluate the present context in light of past experiences. Petty, Brinol, and DeMarree (2007) stated that, though the instantaneous expression of an attitude may vary in strength according to the interaction of remembered experiences within a given context, when people do think about their responses, their attitudes tend to remain stable because an attitude is formed over time through many experiences. When people take the time to think about their evaluations, they consciously and purposefully collect the internal information that they will then use to make strong evaluations, not weak judgments. Ajzen (2001) described the stability of an attitude based on the situational context, stating that an attitude was stable only when its supporting beliefs were readily accessible; in other words, people who know what they believe have strong, stable attitudes toward what they are judging.

Changing an attitude requires a conscious and motivated review of personal evaluations with regard to new information. Because strong attitudes tend to remain fixed through varying situations (Schwarz, 2007), Bohner and Dickel (2011) stated that, rather than outright replacing old attitudes, new attitudes overlay old attitudes and “tag” the old attitudes as either correct or not. Thus, when a person evaluates something, that person must purposefully think through the evaluation in light of the validity of former attitudes; and this purposeful process strengthens the new attitude. Specific to this study, Christian college students’ exposure to YEC information leads to a change in the strength and direction of the students’ worldviews, and this worldview change can be studied by measuring the students’ changes in attitude (Boldrin & Mason, 2009).

**Self-reporting surveys.** Surveying respondents is one of the leading tools for researchers to determine demographics and tendencies of human populations (Anseel et al., 2010). Self-reporting surveys are the primary way to measure and thereby determine a person’s
worldview (Nassar-McMillan et al., 2010). Quantitative self-reporting instruments, such as surveys with Likert scales, assign a number to the strength or degree of agreement one has with certain worldview statements (Deckard, DeWitt, & Pantana, 2008); the quantitative worldview assessment allows researchers to look for positive and negative correlations between worldview values and other measurement values, such as test scores, gender, education, socioeconomic status, ethnicity, etc. (Howell, 2011). Qualitative self-reporting instruments, such as surveys or interviews using open-ended questions, ask respondents to describe their opinions or attitudes; and researchers sort the comments according to key words and representative ideas (Koskey et al., 2010; Radcliffe, 2013).

Though attitudes tend to remain consistent throughout a survey, respondents may not represent their true attitudes or opinions (Desimone, Smith, & Frisvold, 2010). Because studies rely on having an appropriately large number of honest answers (Skalland, 2011), several studies have shown that researchers can increase the validity of these self-reporting instruments by adequately designing prompts that force participants to think critically about themselves and about what they know and believe; but this must be accomplished without telling the participants what to think (Astin, Astin, & Lindholm, 2011; Forray & Woodilla, 2009; Nassar-McMillan et al., 2010; Samuelstuen & Bråten, 2007; Vidal, 2012). Anseel et al. (2010) found that “response enhancing techniques” such as rewards, anonymity, and personalization further strengthen the validity of responses. Also, Haeffel and Howard (2010) found that not only are people able to reliably self-report their attitudes and beliefs, but self-reporting is a more valid predictor of attitudes, beliefs, and thinking than are behavioral measures. Last, self-reporting instruments have high validity when completed soon after a tested activity (Samuelstuen & Bråten, 2007) and when written within a very specific context (Sanford, 2010).
Self-reporting is a valid means of determining one’s worldview when the surveying instrument guides the participants through self-reflection by using questions or other prompts. Even when a person cannot describe all aspects of his worldview, there are five philosophical constructs that determine or affect everyone’s worldview: cosmology, epistemology, ontology, axiology, and teleology (Matthews, 2009c; Obasi, Flores, & James-Myers, 2009). Cosmology asks what is the nature of the universe, epistemology asks what is knowledge, ontology (often associated with metaphysics) asks what is reality, axiology asks what has value, and teleology asks what is man’s purpose? A proper measure of worldview must include a reflection on at least some of these constructs in order to present the most accurate and effective description of one’s worldview (Aerts et al., 2007; Astin, Astin, & Lindholm, 2011; Kim, Fisher, & McCalman, 2010; Obasi, Flores, & James-Myers, 2009). To aid in the process of critically evaluating one’s worldview, Sire (2009) asked eight questions, similar to what Valk (2010, 2012) called the “ultimate questions” and what Astin, Astin, and Lindholm (2011) called the “Big Questions.” The answers to these questions help a person understand the presuppositions behind his interpretation or view of the world. According to Magee and Kalyanaraman (2009), situational factors like these questions are important because they force people to actively and critically explore their own worldview rather than consider passively the mere idea of worldview or what they think their worldviews “should be.” As Kim, Fisher, and McCalman (2010) stated, answering several types of questions involving constructs like those listed above help people to find the blind spots—or conflicts (Sire, 2009; Valk et al., 2011)—in their understanding and application of their worldview, making their worldview measurable. Finally, Astin, Astin, and Lindholm (2011) and Portelindha et al. (2012) determined that self-reporting survey instruments deliver higher degrees of reliability when several different types of responses are provided.
because participants must think critically and are therefore more consistent. All of the above suggests that the validity of a self-reporting survey instrument increases significantly when participants are required to respond to several types of questions or statements that prompt critical thinking.

**Worldview summary**

Worldview can be defined as a way of living out one’s beliefs based on his interpretation of the world and his part in it. Though one’s worldview generally begins as a reflection of the worldview of family and friends, one’s worldview changes as experiences, knowledge, and beliefs affect interpretations of the world and reactions to life’s varied situations. Because Christians need a biblical worldview to fulfill their mandate to minister in the world around them and because college students experience one of the last stages of accepting external guidance, any Christian who has a young person under his authority needs to know what that young person’s worldview is so that the authority figure can fulfill his responsibility to develop that worldview according to biblical principles (Hebrews 13:17; Deckard, Henderson, & Grant, 2002). Measuring worldview is possible and necessary; and though not all authority figures will have access to a survey for those under their authority, the context of this study addresses Christian college professors who can administer a survey to students regarding a YEC worldview; and those professors need to know that such a survey can be helpful. Perhaps the most important effect of using survey results will be knowing how to create a consistent description of creationist principles (Deckard, Henderson, & Grant, 2002).

**Gender Theory**

Throughout recorded human history, men have asserted themselves as the overt leaders in almost all aspects of life, including the home, religious traditions, education, and educational
opportunities (Kenway & Gough, 1998). Especially over the course of the last century, however, that trend has changed as women have gained increasing power and access to more and greater educational opportunities that were traditionally presented only to men students (Kenway & Gough, 1998). With developing educational access for women, people have realized that an education system largely founded by and for the male population is not able to sufficiently address the needs of its growing female population; accordingly, a large portion of society expressed increased dissatisfaction with male-dominated education (Dillabough, 2001). In turn, many researchers worked to developed several versions of a gender theory that can effectively describe the differences between males and females so that increased understanding might lead to, not just opportunities, but equal opportunities (Dillabough, 2001).

The terms gender theory or gender studies can involve complex discussions because gender theory has been developed out of a wide range of different philosophies, psychologies, and sciences. Contributing sources are as diverse as Freudian psychoanalysis (Mitchell, 1974), social learning theory (Bandura, 1986), feminism (Hoff Sommers, 1995), and queer theory (Butler, 1990). Though gender studies began as an application of feminism or feminist ideals to what had perhaps been male-dominated topics, now gender studies also include applications of ageism, racism, classism, and sexual orientation activism (Cuesta, 2014; De Welde et al., 2013; Stake, 2006). Because gender theory has such a diverse and multifaceted character, there exists a wide range of gender theorists presenting an even wider range of gender-related theories; therefore, gender theory is not a single theory but a spectrum of ideals, constructs, and principles that range from the conservative and sacred to the liberal and secular. It is, then, most important that any application of gender theory be specifically defined so that it can be efficiently applied to any discussion.
Defining gender

As is often the case in academic discussions, one must define the terms being used in order to obtain and communicate a deeper, fuller comprehension of the discussion. Though there was a time when the terms gender and sex were synonymous or defined similarly, especially in sacred institutions, many secular researchers and theorists separate the two terms along biological and sociocultural lines. In most academic discussions, whether sacred or secular, the term sex specifically references one’s biology: a person is described as a male or a female based upon either anatomical features or chromosome pairings (XY versus XX, respectively); however, especially in secular discussions, the term gender references one’s role or behavior in his culture or society, but without necessarily implying anything about sex or sexuality (De Welde et al., 2013; Loewen, 2011).

**Biological definition.** Though the word gender is less often used synonymously with the word sex to indicate the presence of a certain set of reproductive organs, many people still view gender as a sex-related characteristic. Biological processes occur during a baby’s development, and these biological processes are driven by chemical reactions that happen, by and large, without input or direction from the mother or the environment. Several researchers (Gurian, 2011; Hearn & Hsu, 2011) supported this relationship between sex and gender by defining gender as a biologically determined difference in the expression of genes resulting in sexed development, and these gender-related biological and chemical differences should lead to gender-related differences in expression. For instance, without addressing sexuality, Halpern (1997) noted that the hormones distinguishing male babies from female babies also affected several other stereotypical, gender-specific characteristics such as visual-spatial and language skills. Gurian (2011) stated that the difference between how boys and girls learn was due to the
biological differences that make them boys or girls because the biological differences naturally followed differences in brain structure and chemistry. This idea was also supported by Kommer (2006) and Kruger (2008) who both studied the brain chemistry of each sex and determined that their different brain chemistry caused males and females to think differently, with males thinking like other males and females thinking like other females. Thus, when gender is based on biological differences, the human population is sorted into one of two groups: male and female.

**Sociocultural definition.** Though they still define sex as a biological designation, other researchers define gender according to the influences of sociocultural expectations or models. Bandura (1986, 1988) said that gender is shaped by a person’s society and culture; therefore, a person’s gender is defined based on the extent to which the person agrees with the society and culture. In other words, a person is feminine if that person exhibits what the society and culture define as feminine. If a person does not exhibit traits that the society and culture define as feminine, then the person is not feminine in that society or culture. Rather than label people based on their biological sex as males or females, Rasmussen (2009) stated that gender is a masculine-feminine binary. Vygotsky (1978) supported the idea of society and culture, defining gender when he stated that children observed the gender roles generally displayed by each sex and took on the roles determined by their own sex. Thus, when gender is defined according to sociocultural means, the human population is generally sorted into one of two groups: masculine people act like males, and feminine people act like females.

**Current secular definition.** In current secular discussions, the sociocultural definition of gender is often paired with the biological definition, and then the combined definition is built upon. While simple gender theory states that biology determines a person’s foundational gender, sociocultural norms further shape the expression of a person’s gender (Diamond, 2006; Eliot,
Together, these two means of defining gender generally work to categorize gender as either male or female. However, several researchers have rejected the idea that gender is defined simply by biological, societal, or cultural factors alone; instead, they insist that gender is a further interaction of any of these factors with personal choice and expression. For instance, Paechter (2006) rejected the idea of the simple binary genders male and female, stating instead that masculinity and femininity are defined by the relative power one wields in a social context.

Though Paechter’s ideas suggest that gender is fluid and dependent on situation or context, Clegg (2007) noted that Paechter still presented only two primary elements of gender, masculine and feminine; but Clegg further stated that there are shades of transition between the two extremes. Butler (1990) agreed, stating that gender is determined by what a person does and how that person acts, not by that person’s biology, chemistry, or society or culture. Further, McDermott and Hatemi (2011) distinguished three overlapping and interacting components of gender: biological sex as possessing either male or female reproductive organs, gender as masculinity or femininity, and sexual preference as attraction to men or women. Considered altogether, because the modern definition of gender is founded in one’s behavior, the terms male and female are often also paired with one of the descriptors masculine or feminine, which together create four categories that broaden and generalize the spectrum describing one’s behavior or one’s personal “performance of gender”: masculine male, feminine male, masculine female, and feminine female (Borhart & Terrell, 2014; Schneider & Roncolato, 2012). As is apparent, secular gender theorists do not define one’s gender as a product of nature; instead, one’s gender is dependent upon one’s interpretation of the intersection of biology, sociocultural factors, and behavior (Bulanda, 2013; De Welde et al., 2013).
**Biblical definition.** When comparing secular gender theory to a literal interpretation of the Bible, it is obvious that current secular gender theory does not coincide with biblical principles (Coakley, 2009; Llewellyn & Trzeiatowska, 2013). Because this study involves Christian beliefs, it is important to define *gender* from a biblical standpoint. In an article addressing the Christian view of gender equality, Kohm (2008) noted that when sexuality is “no longer defined by a higher law, it is pliable, based on personal experience rather than transcendent authority”; and this makes gender into a personalized social construct rather than a construct based on the Bible’s authority as the Word of God (p. 350). As Lefkovitz (2011) stated, God created only two genders when He created Adam and Eve as the first humans in the Garden of Eden. Therefore, if God is the Creator of mankind, then God is the “transcendent authority” that Kohm spoke of, and He has the right to define gender; and according to Lefkovitz, God defined gender by linking it to biological sex.

In support of the link between biological sex and gender, the Council on Biblical Manhood and Womanhood (CBMW, 2012) defined gender from a literalist interpretation of the Bible. Regarding gender, the CBWM website listed two core beliefs based on verses in the Bible:

1. Both Adam and Eve were created in God’s image, equal before God as persons and distinct in their manhood and womanhood.
   2. Distinctions in masculine and feminine roles are ordained by God as part of the created order and should find an echo in every human heart.

The first core belief indicates that God created two distinct sexes, and in support of the first core belief, the CBMW cited Genesis 1:26-27:

> And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth on the earth. So God created man in his own image, in the image of God created he him; male and female created he them.
The second core belief indicates that God created two genders that were distinct based on their sex; and in support of the second core belief, the CBMW cited Genesis 2:18, 21-24:

> And the LORD God said, It is not good that the man should be alone; I will make him a help meet for him.
> And the LORD God caused a deep sleep to fall upon Adam, and he slept: and he took one of his ribs, and closed up the flesh instead thereof; And the rib, which the LORD God had taken from man, made he a woman, and brought her unto the man. And Adam said, This is now bone of my bones, and flesh of my flesh: she shall be called Woman, because she was taken out of Man. Therefore shall a man leave his father and his mother, and shall cleave unto his wife: and they shall be one flesh.

These verses indicate that the two different sexes were created to fulfill two different and distinct roles. In light of a literal interpretation of the Bible, these two different roles describe the two created genders based on the related biological sex.

According to a literal interpretation, the Bible states that males and females are different because God made them distinct from each other, assigned them different roles, and made them to complement each other (Genesis 1:27; 2:18; Ephesians 5:22-28; CBMW, 2012; House, 1988; Knecht & Ecklund, 2014; Whitehead, 2014). Though not drawn directly from the Bible or biblical principles, Gurian’s (2011) gender theory generally stated that males and females have inherent differences in their brain structures and brain chemistry that occur for the same biological reasons that males and females have different sexes, and these biological differences cause them to learn and behave differently. As is apparent in Gurian’s theory then, a person’s gender is directly linked to that person’s sex—a concept that may not be accepted by all gender theorists (Byron, 2014; Johnson & Repta, 2012; Shepherd, 2015; Warner & Shields, 2013) but that is consistent with the Bible.

**Importance of gender studies**

As demonstrated by gender theory’s roots in feminism, an important goal of gender studies lies in the promise of equality. From a biblical perspective, gender equality does not state
that, except for biological differences, males are the same as females; instead, as House (1988) stated, males and females have equal value before God, though they may have different roles, abilities, or aptitudes. At the same time, because some may misinterpret either society’s expectations of each gender or the Bible’s teaching regarding gender roles, gender studies are important to ensure that people are not unnecessarily limited by accepting a given role that has been thrust upon them simply because someone else says so (Cuesta, 2014); instead, men and women should have equal opportunities to discover for themselves what their biblical roles are as males and females, respectively.

The primary framework of this study involves worldview, and one of the important goals of this study is to determine whether each gender is equally exposed to biblical worldview development. Sire (2009) and Bryant and Astin (2008) stated that people who live contrary to their professed worldview tend to be less happy and less satisfied with life than those who live according to the worldview that they say they hold—even to the point of experiencing poor psychological and physical health. Thus, gender studies can serve to help prevent “structured ambivalence,” the acceptance of worldview inconsistencies among cultural beliefs, personal beliefs, and outward relationships (Bulanda, 2013). Along the same line of thought, because gender theory is founded in the feminist reaction against a long-standing male bias, gender studies may also prevent the “pendulum effect” of swinging too far to the opposite end of the discussion, whether or not that bias is correctly perceived (Bleakley, 2013). Finally, another important part of gender studies involves measuring the “interconnectedness” of different social institutions that both address familiar concepts (Whitehead, 2014): for instance, the responses to science education and religion education are gendered, and a gender study of these responses in the context of origins worldview may help to demonstrate the reasons behind them.
Gender and worldview

The study of gender within various contexts is a direct application of worldview. Many higher education institutions offer courses in gender studies; and according to Coakley (2009) and Llewellyn and Trzeiatowska (2013), the default nature of secular gender studies either ignore religious applications or are outright “anti-theological,” both of which are obvious worldview-related reactions. As examples of the secular nature of many gender studies, Stake (2006) stated that one of the main roles of gender studies involves the “development of students’ social values and attitudes” (p. 199), Cuesta (2014) said that gender studies instructors actively teach students how to change their view of society with the goal of changing their society, and De Welde et al. (2013) stated that one goal of gender studies to is “denaturalize” cultural behavior regarding gender and roles: there are no “normal” or natural roles for males or females in education, business, marriage or any other type of relationship. The secular focus of current gender studies may be due to the feminist reaction against the perceived male bias mentioned above; and because studying the relationship between gender and worldview is important, it is necessary to define gender in light of the worldview being studied.

Worldview and Gurian’s gender theory. By stating that males and females learn differently because the genders are different and distinct, Gurian’s (2011) gender theory supports the biblical distinction between males and females and may play an important role in studying worldview development. Because worldview is developed and shaped as people mature through life experiences and gain knowledge from those in authority positions (Sire, 2009), Gurian’s gender theory can be expanded from the gendered difference in learning to the gendered difference in worldview development. The difference between how males and females learn can be extended to how they develop their worldview. For example, Mayhew, Bowman, and
Rockenbach (2014) showed that religious undergraduates attending the same college tend to have very similar worldviews; however, despite gaining similar worldview-related education, Ferssizidis et al. (2010) showed that females have a greater intrinsic motivation to develop and uphold social values than do males, a direct application of worldview.

**Gender and education**

Though there was a time in United States history that men had the advantage of obtaining greater access to higher education than women did, men and women have now had equal access to higher education for many years. In fact, since the 1980s, women have actually surpassed men in higher education enrollment (Borzellica, 2012; Snyder & Dillow, 2011); and yet overwhelmingly, males gravitate to the science fields, but females gravitate to the relationship fields that involve care and teaching (Cuesta, 2014). According to Burke (2014), males tend to be more reasoning, and females tend to be more emotional. It may be that, because science and technology fields emphasize reasoning skills, they draw males more than females. And according to Vaillant (2013), emotions can be worked out through one’s religion/spirituality; but females, more than males, find the experience much more satisfying and beneficial (Bulanda, 2013). An important part of gender studies is studying the different learning styles possessed by males and females (De Welde et al., 2014), and the intersection of the gendered response to science education and religion education is found in the study of origins worldview.

**Gender and science education.** As gender equity in higher education has become a reality over the last several decades, college majors still tend to be dominated by gender, with very few female students choosing majors related to science (Charles & Bradley, 2009; Jacobs, 1996; NSF, 2012). Apple (2010) stated that the female under-representation may be due to the “linkage between sex and scientific prestige that continues to limit women’s access to education.
and to resources” (p. 185). Also, Lynch and Nowosenetz (2009) suggested that the under-representation may be due to “gender constructions of SET (science, engineering, and technology)” that imply scientific fields are somehow more suitable for male students, an impression which serves to repel females and attract males (p. 569). At first glance, these reasons may seem plausible because some women have felt intimidated by the large number of men in their science courses (Apple, 2010). For instance, when Fouad et al. (2010) studied students’ enrollment in college-level STEM courses (science, technology, engineering, and mathematics), they found that, while all students “display a decrease in STEM participation over the high school and college years, women’s participation decreases at a higher rate” (p. 362). However, there is no data to support the idea that females are turned away from attending mathematics and science courses by anything other than their own preferences. In fact, Desy, Peterson, and Brockman (2009) studied the effect of gender on non-science majors who took a university science course, and they found that males had significantly higher attitude scores toward science than female students had, despite the females’ higher GPAs. Therefore, it seems that females had no problem taking science courses and doing well in them; rather, females simply did not prefer science as much as the males did.

Regardless of the differences in enrollment by each gender, the difference in students’ attitudes toward science seemed to develop long before the students were ready to choose a college major. Research by Miller, Blessing, and Schwartz (2006) found that, not only is a student’s interest in and attitude toward science developed by the time that student leaves middle school, but the gendered differences in attitude also continues to widen as those students enter high school. By conducting a study that suggested males are more likely than females to view science as needful or necessary, Gömleksiz (2012) further supported the idea that males are more
interested than females in science—as early as elementary school. Sikora and Pokropek (2012) and Nosek et al. (2009) showed that this trend is not confined to the United States, but rather is generally evident in over 30 countries from all parts of the world.

Not only are males more likely than females to display positive attitudes toward science and the science courses they are enrolled in, but female students are also more likely to express negative attitudes. Through a review of the literature, Osborne, Simon, and Collins (2003) stated that the difference in attitude toward science began a significant slide as early as the sixth grade. When Desy, Peterson, and Brockman (2011) conducted a study of middle school and high school students that was very similar to the university study they published in 2009, they found that female students express more anxiety toward science and have less motivation to study or enjoy science. The difference between the genders in regard to science may not be confined to attitude. The National Science Foundation (NSF, 2009) found that, by the eighth grade, males not only like science better, but they also start testing better than females. Research by Mihladiz, Duran, and Dogan (2011) has suggested that males simply tend to perform better in science courses, even though females might enjoy the learning process more.

In summary, males generally possess and display more positive attitudes toward science. Desy, Peterson, and Brockman (2011) found that “despite nearly 25 years of research focused on gender differences in attitudes toward science, recommendations to counter the trend, and presumably the implementation of these recommendations, gender differences in attitudes toward science still exist among middle school and high school students in the U.S.” (p. 29). After reviewing the literature regarding science and gender, Kenway and Gough (1998) found that males generally have higher test scores in science and stated that “one of the puzzles of the area of gender and science education is that, while all of the researchers are concerned about the
absence of women in science, remarkably few are willing seriously to entertain the notion that science is a masculine discourse” (p. 14).

**Gender and religion education.** There seems to be a gendered difference between males’ and females’ responses to religion education and religious expression. In separate studies, Hammermeister et al. (2005) and Bryant (2007) found that females are more religious than males. Further, Hoffman and Bartkowski (2008) found that, not only are females more religious than males, but females also respond more positively to religion education than males do—that is, females are more inclined to accept a literalist interpretation of the Bible and are more willing to change some aspect of their lives in response to religion education. Though Simpson et al. (2008) completed a study that suggested gender effects on religiosity may not be as clearly defined as other studies indicate, their study did compel them to posit a link between religiosity and a person’s depth of masculinity or femininity. Though Simpson et al. acknowledged that their participants “were recruited from overtly religious populations [in which almost all participants regularly attended religious meetings] rather than universities” (p. 50), a lack of diversity which limited the generalizability of the study (p. 51), the results of the study did emphasize the need for further research regarding the effect of gender on religion education.

The gendered commitment to religion is evidenced via biblical interpretation and belief in the Bible’s inerrancy. Hoffman and Bartkowski (2008) found that women are significantly more likely to interpret the Bible literally than men are. In fact, using both the cumulative 1984-2002 General Social Survey and the 2000 Religion and Politics Survey, Hoffman and Bartkowski found that 28.0% and 32.6%, respectively, of men held to a literal interpretation of the Bible, whereas 37.6% and 36.7%, respectively, of women held to a literal interpretation. In another study, Bartkowski and Hempel (2009) found that conservative female Protestants were more
likely than their male counterparts to believe in biblical inerrancy. These studies suggest that women are more likely to view the Bible as an authority in religious matters than men are, a finding which implies a more positive response to religion education.

In summary, males and females express different attitudes toward religion. In general, women are more religious and express their religiosity more than men do. Also, women have a greater tendency to interpret the Bible literally and to view it as inerrant. This trend exists in both liberal and conservative denominations, and it also exists across all ethnicities (Hoffman & Bartkowski, 2008).

Summary

Though gender has been described in several ways, the definitions generally categorize people into two groups: male and female, masculine and feminine, or men and women. Males and females are physically different, biologically different, chemically different, and socioculturally different. With these differences, males and females are bound to react differently in the same environments and under the same conditions. These different reactions are consistently observed in science education and religion education. The trends for responses to science and religion are gendered, but there is no obvious reason for that difference. The intersection of religion and science can be observed in an origins course, and this study seeks to expand the research regarding the effect of gender on attitudes toward religion and science education in an origins course.

Analysis of Origin Studies

Because a person’s worldview changes and contains internal conflicts, worldview must be studied in a narrow context; and this study is focused on the effect of one’s belief about origins on his worldview. While the body of literature regarding worldview is vast, only a small
amount addresses the effect of an origins course on the change in worldview. Currently, the literature fails to address the relationship between one’s current YEC worldview and the change in that worldview. Most of the origins-related worldview literature (Barnes, Keilholtz, & Alberstadt, 2008; Deckard et al., 2003; Deckard, DeWitt & Pantana, 2008; Francis & Greer, 1999; Rutledge & Warden, 1999; Rutledge & Sadler, 2011; Schilders et al., 2009; Wagler & Wagler, 2013) addresses the worldviews that people have and then compares those worldviews to a belief in some shade of evolutionism or creationism. When searching the databases available in the Summon search engine through Liberty University, using the search terms “worldview AND (creation OR creationism OR creationist) AND (evolution OR evolutionist)” provided over 8,300 results. Only a handful of these articles address the worldview effect of an origins course, and those that do discuss the effects of an origins course stop short of relating the participants’ original worldviews to the changes in their worldviews. Few of the creationist studies address the effect of a creationist origins course on the change in creationist/biblical worldview, and the evolutionist studies use biology courses rather than an origins course that specifically references or discusses evolutionist origin topics. The lack of research regarding the effect of students’ original worldview on the change in worldview suggests a gap in the literature. This analysis section will address the treatment of creationist worldview from the creationist and evolutionist perspectives by analyzing the most frequently referenced evolutionist researchers and the most frequently referenced creationist researcher.

**Contrasting worldviews**

Creationists and evolutionists have worldviews that are very different from each other. Both worldviews are based on a belief in some original existence, but creationists believe the original existence was spiritual while evolutionists believe the original existence was physical.
Creationists believe that God as a spiritual being existed before anything else, and He created out of nothing the universe, its contents, and life as recorded in Genesis. Evolutionists believe instead that matter and/or energy existed as an infinitely dense and infinitesimally small speck that exploded during the big bang, then organized and condensed into the universe and its contents, eventually evolving over billions of years from nonliving inanimate matter into highly complex living organisms (Zubry, 2010). Creationists found their beliefs on the Bible as the authoritative Word of God, originally inspired by God and then preserved by God from its original writings so that modern humanity can know the God Who created all things for man and Who created mankind for fellowship with Himself. Evolutionists found their beliefs on naturalism, a belief that only the physical exists and that the universe can be known only through the application of natural laws; this reliance on naturalism limits evolutionists’ beliefs to the physical part of the universe, forcing them to state that the universe, its contents, and life developed through random changes over long geologic ages for no apparent purpose (AAAS, 1990; Dawkins, 1996; Ruse, 2003) and according to the best guesses of fallible humankind. Creationism is an authoritative worldview that emphasizes the spiritual nature and purposeful existence of man, but evolutionism is a wavering worldview that embraces only the physical nature of man and gives him no purpose at all. The differences between worldviews produce vastly different ways of interpreting the world and living out one’s beliefs.

**Evolutionist studies**

Several evolutionist researchers have completed studies that are representative of objective studies that relate evolutionary courses to changes in creationist worldview. Because so many of the evolutionist studies have been completed by researchers using the *Measure of Acceptance of the Theory of Evolution* (MATE) instrument developed by Rutledge and Warden
(1999), an analysis of Rutledge’s instrument can summarize the reliability of many other studies. At the same time, many evolutionist researchers have exhibited their extreme bias against the creationist worldview by ignoring, misinterpreting, or misconstruing the statistics drawn from their studies. Because so many evolutionist studies cite the Lawson and Worsnop study (205 citations on Google Scholar alone), an analysis of the Lawson-Worsnop study can summarize the findings of other studies that are similarly biased.

**The MATE studies.** The MATE is a validated and reliable instrument for measuring evolutionary worldview. The MATE was validated by a panel of experts (Rutledge & Warden, 1999) and by use among high school students, college students, high school teachers, and college professors; and the MATE has shown very high reliability with a Cronbach’s alpha values consistently ranging from 0.70 to 0.90 (Deniz, Donnelly, & Yilmaz, 2008; Ha, Haury, & Nehm, 2012; Peker, Comert, & Kence, 2010; Rutledge & Sadler, 2007; Rutledge & Sadler, 2011; Rutledge & Warden, 2000; Trani, 2004). In fact, Wagler and Wagler (2013) tried to show that, while the MATE has been used successfully to assess acceptance of evolution by a wide variety of teachers and students in secondary and higher education, the MATE was not reliable for all academic populations. However, though their study included samples of “novice-level” evolutionist groups such as elementary teachers and specific ethnic groups with stereotypically strong religious beliefs, their study concluded that the MATE “may not” have reliably described Hispanic elementary teachers. Regardless, their study still showed a very high reliability (0.85) in a population of “novice-level” evolutionists. In summary, even when Wagler and Wagler tried to show that the MATE was not reliable for all groups, they found that it actually was quite reliable.
The Lawson-Worsnop study. In stark contrast to the MATE, the instrument developed and used by Lawson and Worsnop (1992) was neither valid nor reliable (Deckard, DeWitt, & Pantana, 2008). While the Lawson-Worsnop (LW) instrument contained several questions from a validated test of scientific reasoning (Lawson & Worsnop, 1992), the LW also contained several creationist statements that had not been validated by the authors themselves, much less any other researcher. In fact, experts (Deckard, DeWitt, & Pantana, 2008) in creationism showed that several LW statements that were meant to identify creationists actually do not because the statements do not represent creationist beliefs, showing that the LW had poor validity. When Deckard, DeWitt, and Pantana (2008) compared the CWS to the MATE and LW, they found that the LW did not measure creationist worldview as consistently as did the MATE and CWS.

Flaws in the Lawson-Worsnop study. Lawson and Worsnop (1992) completed a study that is representative of the evolutionist worldview bias that leads to poor scholarship and faulty conclusions because it was not at all representative of objective evolutionist studies that relate evolutionary courses to changes in creationist worldview. Lawson and Worsnop tried to determine whether reflective reasoning skills and religious commitment to a belief in biblical creationism affected high school biology students’ acceptance of evolution after a three-week course presenting evidence for evolution via topics including comparative anatomy, embryology, the fossil record, and biochemistry (p. 149). The Lawson and Worsnop study had two guiding questions: “What factors affect students’ ability to learn science concepts…? In this case the topic is evolution.” and “What factors influence students’ ability to reject prior nonscientific beliefs…? In this case the nonscientific beliefs involve special creation” (p. 143). The Lawson and Worsnop study was fundamentally flawed in at least two major aspects: a personal bias
against creationism and a basic misunderstanding of creationist beliefs (Deckard, DeWitt, & Pantana, 2008); and these two flaws led Lawson and Worsnop to sloppy scholarship and wrong conclusions regarding their guiding questions.

The Lawson and Worsnop study was flawed because the authors showed personal bias against creationism throughout. Though the sentiment was repeated throughout their article, one quotation is representative of the bias found in the Lawson and Worsnop study:

Lawson and Thompson (1988) argued that skill in reflective reasoning enables one to modify prior beliefs; therefore [sic] the extent to which students hold nonscientific beliefs should be related to this reasoning skill as well. In other words, students who lack skill in reasoning hypothetico-deductively are more likely to begin any particular period of instruction holding nonscientific beliefs [in this context, belief in special creation], and they are less likely to discard them in favor of the scientific belief [belief in evolutionism] during instruction because they lack skill in using the necessary reasoning pattern to do so (p. 144; emphasis added).

Throughout their article and in the above quotation specifically, Lawson and Worsnop showed their personal bias by stating that belief in evolution is scientific but that belief in special creation is not. Further, Lawson and Worsnop equated knowledge of and belief in evolutionary concepts with the knowledge of scientific facts and the ability to reason reflectively; in other words, biased researchers like Lawson and Worsnop do not understand creationist worldview because they not only correlate acceptance of evolutionism with superior reasoning ability, but they also correlate belief in creationism with low scientific intelligence instead of recognizing that accepting evolutionism (or creationism) is an extension of worldview. In a further application of this personal bias, though no participants in the study showed any significant change in worldview toward a stronger commitment to either creationism or evolutionism, Lawson and Worsnop still found that belief in special creation implied a lack of reflective reasoning skills. In other words, even though evolutionist students did not demonstrate a stronger commitment to evolution after their biology course, Lawson and Worsnop still said they had strong reflective
reasoning skills because they were evolutionists; but creationist students who could reproduce the evolutionary knowledge after the course were still described as having weak abilities to reason reflectively simply because they did not believe in evolution.

The Lawson-Worsnop study was also flawed because the authors misunderstood basic creationist beliefs. Lawson and Worsnop used 17 statements to determine the participants’ belief in special creation (p. 148). Of the 17 statements, at least nine misrepresent creationist beliefs. Some of the statements combine this misrepresentation with the assumption that creationists do not believe in scientific laws (Deckard, DeWitt, and Pantana, 2008). For example, question one stated, “Landforms like the Grand Canyon were created by God and have not changed since then” (p. 148). Creationists do not believe that God directly created the Grand Canyon; instead, creationists believe that the Flood created the Grand Canyon, and creationists believe that the Grand Canyon has eroded since then according to the principle of uniformity, which states that natural laws have existed throughout the earth’s history. Question four seemed almost purposefully misrepresentative in its presentation of creationist beliefs: “Fossils were intentionally put on earth to confuse humans” (p. 148). Creationists do not believe that God put fossils in the earth to confuse anyone; instead, creationists have long believed that the fossils were formed during the Genesis Flood (Morris & Morris, 1996; Whitcomb & Morris, 1961), which God sent during Noah’s day as judgment against mankind’s exceeding wickedness. As an extension of this belief, God’s judgment against sin assigns Him the position of supreme authority presented in the Bible; and because the geologic evidence provided by the presence and locations of fossils produced by the Flood provides incontrovertible evidence that the Bible is true, the God of the Bible must exist and must be Who the Bible says He is. Statement five stated, “The color of a person’s skin depends on whether God favored or punished their
ancestors.” While some religious people have taken out of context some passages (Exodus 20:5; 34:7; Numbers 14:18; Deuteronomy 5:9) and applied them inappropriately to state that the descendants of Ham endured slavery because of Canaan’s sin, this Lawson and Worsnop statement is clearly not representative of biblical creationism because the Bible clearly states that God does not punish children for their parents’ sin (Ezekiel 18:1-20). Statement six stated, “Through the ages the kinds of living things on the Earth have not changed to become better ‘suited’ to their environment.” Citing that 82.3% of creationist students disagreed, Lawson and Worsnop concluded that creationist students must think God created life and then allowed evolution to occur afterward; however, creationists would reject the implied evolution of living things in favor of obvious adaptation through breeding and natural selection, scientific principles that are obviously at work today but that do not result in the change of one kind into another. Statement twelve said, “The living world is being controlled by a force greater than humans”; statement 16 said, “All events in nature occur as part of a predetermined master plan;” and statement 17 said, “All events in human life occur as part of a predetermined master plan.” Creationists believe that God is ultimately in control and intervenes as He deems necessary, but God also attributes to mankind a free will, the opportunity to make his own choices; and that free will not only comes with it the ability to influence and involve others but also the responsibility for punishment and reward. Though Lawson and Worsnop commented on only a few of these statements, the very wording of the statements showed that Lawson and Worsnop did not understand the creationist principles they sought to measure.

Lawson and Worsnop’s own instrument supported the charge that they grossly misunderstood creationism. Lawson and Worsnop reported a test-retest reliability of $r = 0.46 (p < 0.001)$, which is so low a reliability value that Lawson and Worsnop’s own study actually
shows that their instrument is not only unreliable (Leach, Barrett, & Morgan, 2005; Pallant, 2007), but “unacceptably” unreliable (Williams, 2014) because a value of $r = 0.46$ shows that the instrument is 54% unreliable (Brown, 2002). Rather than admit or address their instrument’s low reliability, however, Lawson and Worsnop showed their personal bias against creationism by continuing to use their data to draw several conclusions regarding the relationship between students’ reflective thinking skills and their belief in creationism despite the low reliability. Only the belief questionnaire portion of the instrument had acceptable reliability ($r = 0.82$), and it showed that students’ beliefs did not change significantly due to the evolutionary education, despite Lawson and Worsnop’s misunderstanding of creationist principles.

Effects of the Lawson-Worsnop study. The Lawson-Worsnop study did not answer the two guiding questions: “What factors affect students’ ability to learn science concepts [evolution]?” and “What factors influence students’ ability to reject prior nonscientific beliefs [special creation]?” (p. 143). The first question could not be answered because, at best, rather than showing a relationship between scientific reasoning and worldview or beliefs, the Lawson and Worsnop study merely measured topical science IQ, the knowledge of a specific topic in science—in this case, the topic was evolution.

The second question could not be answered because none of the students, evolutionist or creationist, changed their beliefs regarding creationism or evolutionism. Lawson and Worsnop did not find a statistically significant relationship between reflective thinking ability and a rejection of creationism in favor of evolutionism. Because the pretest scores before instruction and the posttest scores in knowledge after instruction in evolution were “substantially below the ceiling of [the possible score]” (p. 149), Lawson and Worsnop concluded that “reflective reasoning skill has no direct effect on posttest belief” (p. 164). However, again demonstrating
their bias against creationism, Lawson and Worsnop later stated that “reflective reasoning skill appears to influence prior knowledge and posttest knowledge, which in turn influences belief” (p. 164, emphasis added). In other words, even though Lawson and Worsnop had already shown that students’ knowledge and beliefs did not change from pretest to posttest, they tried to convince the reader that students with higher reflective reasoning abilities also had a greater acceptance of evolutionism before and after instruction when, in fact, no such relationship existed: “These mean scores indicate, that as a group, instruction had no overall effect on [any student’s] beliefs” (p. 152), including the students with higher reflective thinking abilities.

Despite the obvious lack of support demonstrated by the group of students involved in the study, Lawson and Worsnop still related gains in previously-accepted knowledge (belief in evolutionism) with higher reflective reasoning skills. In the population of 107 students at Arizona public schools in an evolutionary biology course, it was reasonable to assume that most of the students entered the biology course with some preliminary acceptance of evolutionism. According to Lawson and Worsnop, only one student had both a low knowledge of evolution and a high ability to think reflectively; but based on the large gain in evolutionism knowledge by this single student (less than 1% of the population), they concluded that reflective thinkers more readily accepted evolutionism than did non-reflective thinkers—even though the group data clearly showed no effect. Interestingly, the study also showed that the percentage of creationists increased due to the instruction: from 13.5% on the pretest to 14.6% on the posttest; yet interestingly, Lawson and Worsnop did not conclude that instruction in evolutionism produced more creationists.

*Summary of the Lawson-Worsnop study.* If not to answer their guiding questions about factors influencing students’ ability to learn science concepts or reject nonscientific beliefs, what
was the true purpose of the Lawson and Worsnop study? Showing bias against and an unwillingness to understand creationist worldview, Lawson and Worsnop demonstrated in several ways a flagrant disregard for objective academic research in favor of actively disparaging an opposing worldview. Lawson and Worsnop used a flawed instrument that did not measure what it was supposed to measure; the instrument was not validated before its use, and Lawson and Worsnop’s own data showed the instrument to have unacceptably low reliability. Lawson and Worsnop drew unsupportable conclusions based on their data because, while their data showed no statistically significant change in beliefs due to instruction, they still concluded that reflective thinkers accept evolutionism. The purpose of the Lawson and Worsnop study, then, was simply to throw mud on creationism.

**Summary of evolutionist studies.** Evolutionists can study creationist worldview objectively despite having a worldview that is nearly opposite the Bible and creationist worldview. The Rutledge studies (1999, 2000, 2007, 2011) showed that objective measurement of worldview is attainable, and Wagler and Wagler (2013) showed that worldview measurement is attainable even in narrowly defined groups that do not have an extensive training in worldview development. In many respects, Lawson and Worsnop (1992) also showed that worldview is measurable, but they also demonstrated the ease with which a biased researcher can misrepresent, misconstrue, and misunderstand what is being measured. Though the goal of evolutionists is less about understanding the creationist worldview and more about increasing adoption of the evolutionist worldview, evolutionist researchers would better understand their own situation by better understanding the creationist worldview that they are fighting against; and the studies led by Rutledge accomplished that goal objectively, but Lawson and Worsnop did not. As a measure of evolutionist worldview, the MATE (Rutledge & Warden, 1999) was a
superior instrument to the Lawson-Worsnop instrument (Lawson & Worsnop, 1992). The MATE is a validated and reliable instrument for measuring evolutionist worldview, but the Lawson-Worsnop instrument is neither reliable nor valid when measuring evolutionist or creationist worldview.

**Creationist studies**

Because much of the current creationist worldview research has involved the use or study of the *Creationist Worldview Scale* (CWS), studying several seminal works involving the CWS will represent the creationist worldview literature. Deckard and Sobko (1998) showed that there was a significant need to develop a consistent presentation of YEC principles, and part of that development involved accurately measuring YEC worldview with a reliable and valid instrument. Deckard and Sobko measured respondents’ creationist worldview by pretesting and posttesting two groups with an early version of the CWS that was called the *Creationist Worldview Test* (CWT, Deckard, 1998) to determine whether attendance to a YEC course would affect their worldview, and they found that the origins course produced significant gains in YEC worldview. Using the PEERS instrument (Smithwick, 1995) as a reliable and valid instrument for measuring biblical worldview, Ray (2001) compared the CWS to the PEERS and showed that the CWS reliably and validly measured the biblical worldview used interpreting scientific facts in the fields of geology and biology. When Deckard, Henderson, and Grant (2002) used the CWT to study whether students developed a YEC worldview from the content or from the teacher, they found that students who were taught YEC principles directly exhibited more significant gains in YEC worldview than students who were introduced to YEC principles by non-YEC teachers. Grouping the CWS statements into three subscales (age, science, and theology) for analysis, Henderson, Deckard, and DeWitt (2003) showed that college students
exhibited gains in YEC worldview due to their enrollment in a YEC course. Deckard et al. (2003) showed that, while students from different types of high schools may have significantly different YEC worldviews, all students experienced gains in YEC worldview after enrollment in a YEC course. Deckard, DeWitt, and Cargo (2003) measured the YEC worldviews of college students in two different sections of the same origins course and found that their gains were significant only in the science and age subscales; the authors hypothesized that changes in the theology subscale scores were not significant due to high initial scores.

Though all of these studies showed that a YEC origins course produced significant gains in students’ YEC worldview, none of them addressed whether the students’ gender affected their YEC worldviews due to the origins course. That is, the studies did not address whether male or female students with weaker creationist worldviews developed a stronger YEC worldviews compared to those male or female students with initially stronger YEC worldviews.

Summary

An analysis of worldview studies shows a gap in the literature. Creationist research relating the study of origins to YEC worldview stopped short of relating participants’ gender to their YEC worldviews after taking a YEC origins course; and not only was evolutionist research flawed because evolutionists do not know the creationist worldviews they are trying to study, but evolutionist studies also stopped short of addressing the effect of gender. For these reasons, research is needed to determine the relationship between students’ gender and their YEC worldviews after taking a YEC origins course, and this study addressed that gap by studying the effect of students’ gender on their worldview after taking an origins course.
Theoretical Framework

Though the Bible does not mention the term *worldview*, the Bible clearly discusses in several places both the orientation of a person’s heart and the change to that orientation. First, the Bible teaches that people live based on what they believe about themselves, others, and the world. Genesis 2 records that for a time Adam and Eve believed God’s warning against eating fruit from a forbidden tree; however, when the serpent spoke to Eve, Eve stopped believing what God had said in favor of what the serpent said and, because of their changed beliefs about themselves and God, Eve and Adam ate the forbidden fruit. In the New Testament, Matthew 12:34 records the relationship of belief to action: Jesus told the Pharisees that their mouths spoke the words against Jesus as dictated by their hearts, which were filled with disbelief. Second, the Bible teaches that knowledge of the material world leads to knowledge of the spiritual world. In Romans 1, the Bible states that what may be known of God spiritually can be seen in the physical creation. In His discussion with Nicodemus, Jesus asked Nicodemus how he expected to know the spiritual truth when he could scarcely understand the material world (John 3). Third, the Bible teaches that accepting spiritual knowledge leads to a change in thinking and behavior. In Mark 4, Jesus told the disciples that everyone is given spiritual knowledge, and those who accept that knowledge receive more; however, those who reject that knowledge lose the opportunities to gain more knowledge and to use the knowledge they have. Also, 1 Corinthians 2 states that the difference between the natural man and the spiritual man is the acceptance of things revealed by the Spirit; and the man who receives the spiritual things of God is further able to evaluate spiritual matters.

In summary, the Bible teaches that people live according to their worldviews, that knowledge of the material world helps people develop their worldviews, and that people change
their worldviews based on their response to the knowledge they acquire. This study is based both on the theory of worldview that states that worldviews will change due to the accommodation of experiences and knowledge and on the learning theories that state students will learn when they observe others in their community and when they are presented with information about the material world (science facts) and spiritual world (biblical truths).

**Theory of worldview**

Worldview theory states that worldview determines how people interpret information and how people accommodate the information to further shape their worldview (Barnes, Alberstadt, & Keilholtz, 2009; Coletto, 2012; DeWitt, 2007; Marshall, Griffeon, & Mouw, 1989; Naugle, 2002; Sire, 2009). As a method of interpreting information, worldview is the application of a person’s framework of beliefs, knowledge, and experiences. The beliefs within the worldview framework have come from a combination of those beliefs learned from observing and interacting with family and community (Coletto, 2012; DeWitt, 2007; Olivier, 2012) and those beliefs developed from one’s own experience, knowledge, and thinking (Mayhew & Bryant, 2013; Valk et al., 2011; Vidal, 2012). The combination of belief sources shows that worldview is a changing expression of world interpretation, a construct that guides the accommodation of new information and guides the change in resulting behavior. When people live out their beliefs, they do so in response to their interpretation of the world, further shaping their worldview according to the framework that defines their worldview. Thus, worldview affects how people develop and display their worldview because people change the way they interpret the world, the way they think, the way they behave, and the way they view themselves and others (Sire, 2004). Therefore, though the study of worldview is a complex process, worldview can still be studied
because worldview development is a way of learning, and both the observational and developmental learning theories address the two general stages of worldview development.

**Learning theories**

Several learning theories address the change in thinking that accompanies the consideration of new experiences, information, and knowledge. Though not specifically addressing worldview theory, Hergenhahn and Olson (2005) stated that learning can be described as the change, or the potential change, in behavior because of the learner’s experiences, which supports the development of worldview presented by many others (Aerts et al., 2007; Sire, 2004; Treviño, 1996; Valk et al., 2011; Vidal, 2012). Though learning theories are often reserved for studying how children develop in their learning, the worldview development experienced by college students demonstrates a similar initial reliance on community and then matures through various stages of further development until almost all changes in worldview are self-directed. Therefore, a more complete understanding of worldview theory is supported by a survey of two influential and relatable learning theories: Bandura’s observational learning theory and Piaget’s developmental learning theory.

**Observational learning theory.** Observational learning theory represents the early stages of worldview generation and development. Albert Bandura developed observational learning theory as part of social (or social cognitive) learning theory to explain how a young person learns certain behaviors by watching others. For example, in the now-famous Bobo doll experiment, Bandura, Ross, and Ross (1961) showed that children can learn to strike an inflatable Bobo doll by watching other children hit it also. At the same time, however, learning by observation involves more than simple imitation; rather, observational learning is a means of processing information and acting on that information (Bandura, 1977; Hergenhahn & Olson,
Where mere imitation would require a person to experience the same situations faced by the person being observed, observational learning implies a vicarious type of learning by processing causes and effects through one’s own thinking and experiences. To include more than the trial-and-error behavior part of observational learning, Bandura (1977) expanded the role of observation from simply learning behaviors to learning “judgmental orientations, linguistic styles, conceptual schemes, information processing strategies, cognitive operations, and standards of conduct” (p. 42). Because people learn through observation, they will have many models, and the result of having many models is the development of knowledge that is an amalgamation of many observations (Bandura, 1986; Miller, 2011).

Though observational learning theory does not address worldview directly, Bandura’s work suggests that people learn much of their worldview from observing other people. Especially when they are children, people gain their worldviews by following the observed worldviews of their family and community. However, just as learning does not stop with imitation through observation, neither does worldview development stop with one’s observation of others. Instead, people filter what they observe through their own experiences and then adapt the results into their own worldviews. According to Bandura (1989), part of the filter people use is self-efficacy, one’s perceived ability to control the environment or to control how the occurrences in the environment affect him. People with strong belief in their self-efficacy address the world differently than those with a weak belief, and the results of either address affect how people will address the world during the next occurrence; thus, self-efficacy before an occurrence shapes self-efficacy after the occurrence—just as worldview shapes worldview.

**Developmental learning theory.** Developmental learning represents the change in worldview due to a person’s maturing ability to think for himself. Jean Piaget designed the
developmental learning theory (or cognitive-stage theory) to explain the cognitive stages in one’s expanding ability to learn (Piaget & Inhelder, 2000/1966). According to the developmental learning theory, learning occurs through four stages:

1. *Sensorimotor*: children learn through their senses and are aware of only their own needs;

2. *Pre-operational*: children begin thinking for themselves, but their rigid thinking means that their logic often fails;

3. *Concrete operational*: children begin formalizing their logic structures and can think through relationships in the reverse;

4. *Formal operational*: children can think hypothetically and abstractly, and their thinking frameworks remain relatively stable.

Though Piaget did not apply the developmental stages of learning to worldview, the same active development can be applied to the change in worldview because the learners’ interpretations of the world change as they learn more about the world and their places in it. At first, children know nothing of worldview; they know only what they want, and they learn of worldview differences only when they discover that their wants conflict with the wants of others. Soon, children realize why there is conflict between their wants and others’ wants, and they begin the process of adjusting their wants to be more compatible with society’s norms; in other words, the children adjust their worldview based on the worldview they observe in others. Next, children begin to accept their society’s norms as their own, and they judge other people based on their adherence to the worldview held by the society. Finally, as children mature into young adults, they can think abstractly about their worldview, and they further shape it according to their own experience, knowledge, and beliefs.
Just as learning is an active process, so is worldview development. Miller (2011) described the developmental process as more than a passive storing of knowledge over the years: “Children’s knowledge of the world changes as their cognitive system develops. As the knower changes, so does the known. . . . Experience is always filtered through the child’s current ways of understanding” (p. 33-34). Treviño (1996) also noted the same process in children’s worldview development: children used cultural experiences within the community and unique experiences with their family to further shape their own worldviews. Adapting Piaget’s idea to the statements by Miller and Treviño, college students in particular filter their experiences through their current ways of interpreting the world to develop their own unique ways of interpreting the world.

The developmental learning theory has several foundational ideas (Hergenhahn & Olson, 2005; Miller, 2011; Piaget & Inhelder, 2000/1966) that can be integrated into the study of worldview theory as college students leave high school and continue to mature through college. Schemata are the building blocks of action, and they can be observable behavior or internal ways of learning something new. The schemata of worldview are the experiences, beliefs, and knowledge that people use to interpret the world. Cognitive structure describes the number and extent of the schemata that are used to filter new experiences and new knowledge. In the worldview context, the more experiences and knowledge college students have, or the more strongly they believe in something, the more able they are to interpret the world according to their experiences, knowledge, and beliefs. Assimilation refers to a person’s response to an experience based on his cognitive structure. According to their worldview, college students react to their interpretation of the world, and this behavior might be an overt action or a covert series of thoughts; this reaction marks the beginning of when college students start to live what they
believe because the belief is their own, not because it was their community’s or family’s belief. *Accommodation* refers to how new experiences change the cognitive structure, and this leads to *equilibration*, the drive to adapt one’s cognitive structures to the experiences. Worldview is shaped by one’s worldview; the more experiences and knowledge college students gain, the more their worldview changes to adapt how they interpret the world because of how they previously interpreted the world. Finally, *interiorization* is the process of increasing one’s use of cognitive structures in the place of gaining information from the physical environment; in other words, people can think through what will happen without having to actually live it out. As college students critique their own worldview, they can apply their worldview to experiences without having to live through those experiences: they can think through hypothetical situations.

Therefore, just as learning to think can be studied by relating how one thinks to how one’s thinking changes, so can worldview be studied by relating one’s worldview to the change in that worldview.

**Summary**

Worldview development is a learning process. When they are children, people’s worldviews are developed through their observation of others around them, their communities and their families. However, as people mature, they begin to actively develop their own worldviews based on their own beliefs, experiences, and knowledge. Because learning theories such as observational learning and developmental learning approximate the learning processes inherent in worldview development, worldview can be studied as a way of learning to interpret how the world works and how to live out one’s beliefs. Therefore, though worldview and worldview development are complex topics, they can be studied, researched, and tested just as the learning theories that approximate them.
Brief History of Modern Creationism

In their books *History of Modern Creationism* and *The Creationists*, Morris (1984) and Numbers (2006) trace the development of the modern creationist movement. A survey of the history of modern creationism shows that creationism has developed over many years of scientific advancement, beginning near the end of the Middle Ages (Singh, 1997). Shortly before the Middle Ages, mankind left their committed study of the Bible, preferring instead to merely listen to what others said about it; this shift in authority eventually cast a 1,000-year shadow of religiosity, superstition, and fear over much of the world from about 500 to 1500, a time that is also commonly referred to as the Dark Ages. However, mankind eventually returned to studying the Bible as his authority, beginning with Martin Luther’s nailing his 95 theses to the church door in 1517; and the renewed focus on the Bible ushered in the Protestant Reformation. As men began studying the Bible again, they found a good and an orderly Creator Who made all of creation to supply for man’s necessity, pleasure, and stewardship. Because part of stewardship involves understanding God’s creation, the return to the Bible also brought forth a resurgence of studying creation to know the thoughts of the Creator (Hill, 2002; Mason, 1953; Montgomery, 2012; Ruse, 2005; Shapin, 1996). Thus began the advent of modern science, based on the assumption that God had made all things as recorded in the Bible.

Creationism before 1859

Writings by some of the greatest and most influential scientists from the 1500s to the mid-1800s show that, though they were not all Christians or Bible-believers, scientists generally believed that God had created or had directed the formation of the universe and its contents (Nelson, 2010). Although some of these scientists would now be classified as old-earth creationists, their writings still demonstrate clearly their belief in or acceptance of God’s direct
hand in the universe’s origin and development; and the majority of these early scientists seem to indicate their belief in the Bible’s description of creation events. Morris (1982, 1984, 1988) listed many scientists who supported the Genesis account of creation; among these are several well-known names: Boyle, Kepler, Newton, Pascal, Ray, Steno, Harvey, Bacon, Linnaeus, Faraday, Morse, Babbage, Maury, Kelvin, Maxwell, and Pasteur. While even evolutionists recognize early scientists’ commitment to the belief in a Creator, the evolutionists seem to ignore or discount the importance placed by these scientists on the integral relationship between one’s faith and the study of the universe as a creation by God. For instance, evolutionist authors have acknowledged that Newton was a Christian who was just as committed to biblical interpretation as he was to theoretical physics (Ruse, 2005; Stenger, 2013), but they will not acknowledge that Newton’s depth of study existed because of his commitment to the Bible (Brooke, 2012; Srivastava, 2007). However, as the following example will show, the great early scientists of the modern age stood against the unbiblical ideas of evolutionism.

One of the foundational concepts undergirding evolutionism is that of common ancestry. Evolutionists state that organisms with similar features have a common evolutionary ancestor, and they base this idea upon the work developed by the creationist Georges Cuvier. Cuvier developed the science of comparative anatomy. Also called homology, comparative anatomy is a study of similar anatomies that have similar functions and construction. The existence of similar parts is one of the pillars of evolutionism because similar parts is supposed to be evidence that one species developed from an ancestor that was similarly shaped. However, a brief look into Cuvier’s idea of homology shows that neither he nor his science supported evolutionism. Integral to comparative anatomy is the principle of the correlation of parts, the idea that all of an organism’s parts are uniquely shaped, necessary, and related so that they can work together for
the organism to function (Smith, 1993). According to Cuvier, while similar parts indicated similar function and construction, it was impossible that the chance evolution of just a few of those unique, necessary, and related parts would make an organism more fit for its environment (Hall, 1999). In fact, in response to the evolutionists’ requirement of long ages for evolution and based on his comparison between ancient mummified cats and modern cats, Cuvier stated that any changes over the course of thousands of years should be multiplicable to infer changes over the course of evolution’s hundreds of thousands of years; however, because no evolution occurred over the observable thousands of years, neither did any evolution occur over the long ages required by evolutionism (Rudwick, 1997; Vasilyeva & Stephenson, 2012; Waggoner, 1996).

**Creationism from 1859 to 1924**

Perhaps the greatest change in interpreting biological, geological, and cosmological data occurred with the advent of Darwinian evolutionism in the late 1800s. Though several philosophers and scientists, notably Jean-Baptiste Lamarck and Charles Lyell, had previously stood out from the scientific establishment to promote some form of evolutionism, not until Darwin published *Origin of Species* in 1859 did the scientist and layman alike have ready access to evolutionary philosophy, concepts, principles, and processes. Darwin explained evolutionary philosophy in a scientific, yet very readable manner that highly appealed to those who did not accept the Bible’s authority regarding origins; and both the scientific and nonscientific communities began to accept evolutionary philosophy either in replacement of or as complementary to the Bible’s record of creation (Kutscher & Niklas, 2004; Morris, 1984).

Bible believing scientists were slow to respond to *Origin of Species*. At first, most scientists rejected Darwin’s theory of evolution, but they saw in his theory a way to explain
man’s upward technological, industrial, and social progress; and soon the majority were moved to accept Darwinian evolutionism in whole or in part (Bowler, 2012). Perhaps because many scientists simply accepted the Bible’s authority in regard to origins, they had not worked out for themselves scientific proofs of or evidences for creationist beliefs. Therefore, while several scientists—such as George McCready Price, Louis Agassiz, and John William Dawson—worked to refute Darwinian evolutionism, they offered little authoritative research that could overcome the rampant acceptance of Darwinian evolutionism; as a result, little work was done to build up scientific creationism or disprove evolutionism. Instead, creationists concentrated on preaching the Bible, relying on the audience’s faith in a simple interpretation of Genesis to promote creationism and creationist ideals, though even many of these creationists preached an old-earth creationism rather than a creationism based on a literal interpretation of Genesis (Montgomery, 2012; Morris, 1984; Numbers, 2006).

In accord with the rising acceptance of Darwinian evolutionism and the slow creationist response, theistic evolutionism began to spread within Christianity. Asa Gray and James Dana, both Christians, were well-known American scientists who accepted and promoted evolutionism as harmonious with the Bible; and though Darwin disagreed with their insistence that God be a part of the evolution process, Gray and Dana worked with Darwin and other evolutionists to expand and promote theistic evolutionism in America (Numbers, 2006). George McCready Price was one of the few prominent creationists during this time; and in his book *The New Geology*, he wrote against many evolutionary geology claims and in support of the biblical flood. However, perhaps because he was a member of the Seventh-Day Adventist church, the influence of his work did not overcome the spread of either evolutionism or theistic evolutionism (Montgomery, 2012; Numbers, 2006).
Creationism from 1925 to 1960

With the rise of science in industry and technology, the biblical account of creation became more a discussion of faith and less a discussion of science. As Ruse (2005) stated, America entered the 1800s on the side of faith in the Bible, but left the 1800s on the side of faith in man’s reason, which led mankind into the arms of evolutionism.

In 1925, American evolutionists challenged the Butler Act, a Tennessee state law forbidding teachers from teaching evolutionism in public classrooms. John Scopes volunteered to stand for the evolutionists against the state, which was represented in court by William Jennings Bryan. Though he was a prominent lawyer and figure, Bryan did not have a strong grasp of either the Bible or the science that he argued for; and he was not able to answer authoritatively, from the Bible or from science, several of the evolutionists’ charges against the Bible (Maddux, 2013; Morris, 1984; Numbers, 2006). Though the Butler Act was upheld in the end, Bryan’s lack of authoritative answers publically and prominently displayed the creationists’ slow response to evolutionism, perhaps solidifying the perceived division between science and religion (Macdonald, 2004). As Marrapodi (2012) explained, “While [creationists] were on the winning side in the courthouse, they quickly realized the battle was not over the application of the Butler Act, but rather over how their ideas and beliefs were received by the public. They saw an unflattering portrayal of Creationists, viewed as ignorant, overzealous, religious simpletons” (p. 95). Though the creationist defense of the Bible was well-intentioned, the Scopes’ trial served only to erode creation science’s credibility and to augment the position of evolutionism.

Creationism from 1961 to 2008

After the double walloping that creationism took from Darwin’s *Origin of Species* and the publicity of the Scopes’ trial, one might wonder how any creationist movement at all exists

Published about two years after the centennial anniversary of Darwin’s *Origin of Species*, *The Genesis Flood* breathed new life into the crippled creationism movement. John Whitcomb was a theology professor who wrote his dissertation on the Flood and its effects; and Henry Morris was a hydraulics engineer with a Ph.D. and a minor in geology (Morris, 1984). Combining their individual interests in a biblical framework for Flood geology and a scientific critique of geological ages, Whitcomb and Morris published a book that answered the evolutionary questions about geology that had stymied creationists for a century (Morris, 1984; Numbers, 2006). Though evolutionists downplayed the scholarship of *The Genesis Flood*, many Christians gladly received the book and began a more intense study of both the evolutionism promoted by man and the creationism presented by the Bible.

**Creationism after 2009**

The year 2009 marked the 150th anniversary of *Origin of Species*, and as such it serves as a fine point in time to survey the position of creationism. Though the creationism movement began with individual scientists and preachers, it has matured into a worldwide movement of societies, institutions, churches, and speakers. Many of these entities represent groups who merely disseminate creationism information, such as the Creation Science Fellowship, Answers in Genesis (AiG), Creation Ministries International, and Creation Today. Others groups are involved in scientific research that continually develops scientific data in the support of the literal interpretation of Genesis and a biblical interpretation of all fields of science; these groups include the Institute for Creation Research (ICR), the Creation Research Society (CRS), the
Christian Apologetics and Research Ministry (CARM), and Creation Research. Other institutions include colleges and universities that have dedicated origins courses: Clearwater Christian College, Colorado Christian University, Liberty University, and Pensacola Christian College.

Summary

The history of creationism as a movement is short, but it follows a biblical pattern mirrored in the Old Testament by the nation of Israel: obedience, prosperity, sin, punishment, repentance, and forgiveness. During the times of sin, there always was a small group that stayed faithful to God; the Bible calls them a “remnant,” and God promised that their faithfulness would not be forgotten or wasted (2 Kings 19:30-31; Ezra 9:8; Jeremiah 23:3; Ezekiel 14:22; Micah 4:7). During the time that man has been turning away from the Bible and toward evolutionism, there have always been a few who refused to leave their faith in God’s Word in favor of man’s reasoning; and God’s promise extended to them just as it did to Israel. The fruit of their faithfulness is fulfilled in the scope and reach of the modern creationism movement.

Creationism

Generally, creationism is thought of as an anti-evolutionist explanation for the origin of the universe, its contents, and life; however, just as many evolutionists believe differently about evolutionism, so do creationists fall into several different creationism camps. While many scientists, Christian and not, have rejected Darwinian evolutionism in favor of the biblical account of creation, many other Christians have wavered and have consequently battled between accepting the Bible as both the spiritual and scientific authority (Harlow, 2008), accepting instead at least some form of Darwinian evolutionism and developing “theistic evolution” theories that combine a non-literal interpretation of the Bible with some form of evolutionism.
The internal battles between accepting the Genesis account of creation and man’s stories of evolutionism resulted in several theories that re-interpret the Genesis account according to evolutionary ideals (Morris, 1984; Numbers, 2006; Winslow, Staver, & Scharmann, 2011). At the same time, as man’s knowledge of the universe and its contents progressed, many evolutionists grew dissatisfied with evolutionism’s increasing lack of scientific support, and they developed other origin theories as well. While the purpose of this discussion is not to compare and contrast different types of creationism or anti-evolutionism, it is important to recognize that the true battle exists, not among the various forms of creationism, but between the biblical account of creation and any unbiblical account or adaptation of evolutionism that might be found in the various “theistic evolution” beliefs.

**Intelligent design**

The intelligent design (ID) movement is less a discussion of creationism and more a response to the inadequate origin explanations provided by evolutionism. However, because many creationists cite research and ideas developed by ID advocates and theorists, it is worth a short discussion in the comparison of creationist ideals.

The purpose of the ID movement is founded upon dissatisfaction with the suggestion that the random, purposeless process of Darwinian evolutionism could produce the order and high degree of complexity obvious throughout the universe. ID advocates state that order and design require a designer, or an *intelligence*, and that many aspects of the universe—such as life itself—are too complex to have originated by naturalistic and materialistic processes (Behe, 2006; Dong, 2010; Johnson, 1993; Mackenzie, 2010). In their dissatisfaction with the randomness required by evolution, ID advocates echoed the sentiment of Gould and Eldredge (2000), evolutionists who proposed punctuated equilibrium in an attempt to address the contradictions between the
fossil record and evolutionism. Central to ID theory is irreducible complexity, the idea that, in order to function and to sustain life, organisms must have many fully-functioning and fully-compatible parts and processes working simultaneously (Aviezer, 2010; Behe, 2006), similar to Cuvier’s “correlation of parts.” Creationists agree with ID advocates that, because evolutionary theory requires the slow development of the simple into the complex through random mutations over long ages, the sudden appearance of these complex parts and processes is impossible.

Though many ID advocates are religious, the ID movement is not a religious or biblical one. Instead of working from a worldview based on the Bible’s authority, ID advocates simply state that scientific evidence does not support random evolution that is driven by purposeless natural processes (Davis, Kenyon, & Thaxton, 1993; Shearmur, 2010). In fact, while many ID advocates insist that some greater intelligence started and/or guided the complex processes of life, this greater being need not be the God of the Bible, and ID advocates do not necessarily reject millions or billions of years of changes (Curtis, 2011; Numbers, 2006). Because the ID movement is not founded on the literal interpretation of Genesis, even evolutionists recognize that the ID movement is not a valid creationist model for the origins of the universe or life (Heaton, 2009). Though the science of the ID movement may support the creationist model, creationists should be careful to distinguish the biblical scientific arguments from the anti-evolutionary arguments.

**Old-earth creationism**

Old-earth creationism (OEC) is a combination of evolutionism and the Bible. The varied forms of OEC are often termed theistic evolutionism, implying that God started or participated in the evolutionary process (Schroder, 1990; Winslow, Staver, & Scharmann, 2011). Generally, old-earth creationists interpret Genesis as an allegory rather than as a literal record of events
The two most common forms of theistic evolution are the long day theory and the gap theory.

**Long day theory.** The long day theory states that God created all of the ingredients for the universe to evolve, and He then set into motion the natural processes that allowed the evolution of the universe and its contents over billions of years (Fischer, 2003; Fowler, 2010; Hefner, 2012; Montgomery, 2012). Ardent evolutionists either argue against or ignore the existence of God, and they state no need for His involvement (Dawkins, 2003); otherwise, evolutionists’ beliefs do not vary significantly from theistic evolutionists’ beliefs regarding the process of evolution. Instead, theistic evolutionists’ beliefs differ from the literal interpretation of Genesis and from biblical principles.

Long day theorists believe in billions of years of evolution, but Genesis states God created everything in six days. As part of the long day theorists’ allegorical interpretation of Genesis, they define the *day* of Genesis as long periods of time rather than as literal 24-hour days. To develop biblical support, they use two primary passages from the Bible. In the King James Version, Psalm 90:4 states, “For a thousand years in thy sight are but as yesterday when it is past, and as a watch in the night”; and 2 Peter 3:8 states, “But, beloved, be not ignorant of this one thing, that one day is with the Lord as a thousand years, and a thousand years as one day.” Long day theorists do not state that evolution occurred within one thousand years for each day of Genesis; rather, they use these verses to say that the definition of time is variable because God exists outside of time and is not bound by it (Fischer, 2003; Harlow, 2008). However, this allegorical interpretation of the *day* of Genesis is inconsistent with other passages in the Bible, specifically Exodus 20:11 and 31:17, where God references the creation week as a pattern for the Israelites’ week of work and rest. Because it is unlikely that God meant for His people to work
for six geologic ages before resting, the Bible seems to define the days of Genesis as literal, 24-hour days. Further, the context of Psalm 90:4 and 2 Peter 3:8 is God’s mercy in holding back judgment against His people’s sin: the Bible teaches that God is righteous and will punish sin; but God is also loving, and in His mercy He will hold back that punishment to give people time to repent.

The order of evolution is quite different from the order of creation. Because the order of evolution events is vastly different from the order of creation presented in Genesis, long day theorists state that the six creative days represent the peaks of the evolutionary process, not the beginnings of each process (Harlow, 2008). For instance, where Genesis states that light was created on day one and the celestial bodies on day four, long day theorists state that celestial bodies began evolving before they produced light, but light was available before the evolution of celestial bodies was completely finished. Thus, long day theorists state that, though Genesis and evolutionism seem to be in conflict, both can be correct if Genesis is interpreted allegorically according to evolutionary ideas.

Evolution requires millions of years of death and suffering through mutations and natural selection, but the Bible states that death is a result of man’s sin. Mutations (or Darwin’s “variations,” 1859) and natural selection are the foundation of evolution (Dawkins, 1989; Mayr, 2001; Nei, 2013); and the general idea is that when random mutations occur in a group of organisms, environmental conditions determine which organisms in the group will survive and thrive while the other, weaker organisms eventually die out. While Harlow (2008) states that physical death is not part of Adam’s curse, the Bible states clearly in Romans 5:8 that death was a direct result of Adam’s sin. Further, beginning with the third day of creation, God described His physical creation as “good” (Genesis 1:10, 12, 18, 21, 25); and after dedicating man to the
stewardship of God’s creation on the sixth day, God said that everything was “very good” (Genesis 1:31). Because God cares for the sparrows (Matthew 10:29), has promised an end of the hunter-prey relationship in nature (Isaiah 11:6), and is not willing that anyone should perish (2 Peter 3:9), it would be inconsistent for God to declare that all of His creation was “very good” if their evolution into modern species required the death of the millions or billions of organisms. Because God is described as “the same yesterday, today, and forever” (Hebrews 13:8) and because God Himself states that He does not change (Malachi 3:6), long day evolutionists must either agree with God’s description of Himself in the Bible, or they must imply that He purposefully misleads readers by requiring an allegorical interpretation of His words.

Long day theorists are old-earth creationists who reject a literal interpretation of the Bible and accept instead the unbiblical principles of evolutionism. In their attempt to reconcile the Bible with evolutionism, long day theorists interpret the Bible as an allegory; however, their unbiblical reasoning leads to conflict with biblical principles and obvious scripture.

**Gap theory.** The gap theory states that there is a gap of time and events between Genesis 1:1 and 1:2 (Fowler, 2010; Langford, 2011; Larkin, 1918; Numbers, 2006; Scofield, 1917). According to gap theorists, Genesis 1:1 implies the existence of a pre-Adamic world that was then flooded sometime before Genesis 1:2 because the fallen angel Lucifer corrupted the world and its inhabitants when he was cast out of heaven as described in Isaiah 14:12-14. Then, gap theorists state that Genesis 1:2 describes the beginning of God’s *second* round of creative acts to make the world that now exists, providing the geological evidence for a world that is both millions of years old and filled with fossils that were deposited by the pre-Adamic flood rather than Noah’s Flood of Genesis 6. Because gap theorists present a create-destroy-recreate process, this theory is also called the *ruin-reconstruction theory.* As with the long day version of theistic
evolutionism, evolutionists disagree with the need for or existence of God; but they do agree generally with the old age of the earth proposed by the gap theory. Further, as was true regarding the long day theorists, the more important disagreement occurs between the gap theorists and both the literal interpretation of Genesis and the application of biblical principles.

The gap theory is based on a misrepresentation of Scripture. Rather than describing or implying two separate creation events, Genesis 1:1-2 can be understood as a summary of the next several verses that detail God’s acts of creation (Fryman, 2010). This summary-detail pattern is easily observed throughout the Old Testament in the description of the tabernacle (Exodus 25:9), the numbering of the Israelites (Numbers 1:18), the giving of the law (Deuteronomy 27:12), and in many of the Psalms and Proverbs. Because of God’s consistent nature, this summary-detail pattern is more consistent with a literal interpretation of the Bible and with God’s character than with any pattern of death-before-sin presented by gap theorists. Also, God stated that He sent the Flood to destroy the corruption on the earth (Genesis 6:12-13), a corruption due to the sin initiated by Adam and Eve, not due to the sin of any organism in existence before them.

The gap theory requires the occurrence of several situations not found anywhere in the Bible. First, while the Bible clearly states that Lucifer was thrown out of heaven, the Bible never states, implies, or hints that Lucifer’s dealings with earth’s inhabitants caused any flood prior to the Flood of Noah’s day. Second, nowhere does the Bible state, imply, or hint that God created, rested, then created again. Instead, the Bible states that God created over a period of six days and then rested on the seventh day to set a pattern for mankind. To abide the pattern required by gap theorists, humans would work, rest, destroy their work, then work again. Because God is not the author of confusion (1 Corinthians 14:33), this pattern required by gap theorists is unbiblical.
As with the long day theory, the gap theory requires death before man’s sin. According to gap theory, the original inhabitants of the pre-Adamic earth were destroyed by a flood. Because God is righteous and punishes sin with death (Genesis 2:17; Ezekiel 18:20; Romans 6:23; James 1:15), gap theory presumes the original inhabitants must have sinned—and perhaps sinned at least as thoroughly as those in Noah’s day in order to require so complete a destruction that left no survivors. However, not only is this incredible sin nowhere mentioned in the Bible, neither does God mention the judgment of the sin. Not only is this reference to pre-Adamic judgment unbiblical, but it also ignores one of the primary characteristics of God: He is love (1 John 4:8, 16), and He loves His creation (Isaiah 63:9; John 3:16; Romans 5:5, 8; 8:9). The pre-Adamic judgment of sin would have occurred before God’s promise of reconciliation through Eve’s descendant (Genesis 3:15); and if the pre-Adamic inhabitants had no relationship to Eve’s descendants, they would have had no hope of reconciliation with God (Romans 5:10; 2 Corinthians 5:18; Colossians 1:20-22), which is inconsistent with God’s nature—He desires that all people be saved from the penalty of their sin and have fellowship with Him (Isaiah 1:18; Ezekiel 18:30-32; Romans 6:23; 10:13; 2 Corinthians 5:21; 2 Peter 3:9).

Gap theorists are old earth creationists who reject a straightforward reading of the Bible and favor instead twisting the Bible and adding to the Bible in an attempt to fit long geologic ages into the Bible’s description of creation. The twisting and adding of unbiblical ideas contrast sharply with principles clearly stated throughout the Bible.

**Young-earth creationism**

Young-earth creationism (YEC) has not changed either in the adherence to the literal interpretation of Genesis or in the application of scientific principles to scientific data; neither have young-earth creationists changed their interpretation of scientific data according to biblical
principles and their belief in an orderly Creator God. Rather, YEC has developed in the sense of maturing: the more advanced scientific technology and scientific theory become, the more that technology and theory point to the Creator described in the Bible. Because YEC is founded on the Bible as the single objective authority, YEC provides the superior understanding of the universe, its creation, and its contents.

YEC follows a literal interpretation of all Scripture. Though often confused, *literal interpretation* is not synonymous with interpreting something *literally* (Bennetch, 1947; Reno, 2011). People who do not understand creationism often state that creationists call for interpreting the Bible literally (Baker, 2012); however, interpreting the Bible *literally* would remove any and all poetry, simile, metaphor, and other literary devices. Whereas *literally* has the idea of “exactly,” *literal interpretation* has the idea of “as written.” Applied thus to the Bible, a literal interpretation of Scripture means that narrative portions are interpreted as narrative, poetry is interpreted as poetical, and history is interpreted as historical. Though the Bible contains poetic devices, allegory, simile, metaphor, and other figurative language, these passages are set off from simple declaration by leading phrases, wording, or context; and none of these devices are used in the description of the creative acts during the week of creation in Genesis (Beal, 2008). Because the Bible’s authority is derived from its existence as God’s written word to man, allegorical or mythological interpretations of Genesis cannot but remove its authority (Smith & Tuttle, 2011).

YEC is based on a straightforward faith in the Bible (Morris, 2000; Whitcomb, 1986; Winslow, Staver, & Scharmann, 2011). Jesus said that people need to have the simple faith of a child (Mark 10:14-15; 2 Timothy 3:15) and just a small faith like a mustard seed (Matthew 17:20; Luke 17:6) to know God and to have a relationship with Him. If God requires man to
possess only a small and child-like faith to know Him, then as a God Who is the same and does not change (Malachi 3:6; Hebrews 13:8), He would require the same small and simple faith to understand His straightforward communications to man in Genesis.

A straightforward reading of Genesis leads man to know several basic facts about the universe (Morris, 1980; Morris, 2000; Whitcomb, 1986). First, about 6,000 years ago, God created the universe, its contents, and life in six 24-hour days by speaking into existence the matter and energy currently found throughout the universe according to the record of Genesis. Second, the original creation was perfect, but it now suffers under the curse of man’s sin; however, despite the curse of man’s sin, creation still operates according to natural laws. Third, while the universe and its contents are physical, man is more than a physical body; he is also a non-physical (or spiritual) soul that communes with a spiritual Being, God the Creator. Thus, the physical world with both its orderliness and decay directs man’s inquiries outside of his ability to reason: there must be more to the universe than what is seen (Romans 1:19-20; Hebrews 11:3).

Young-earth creationism is based on a straightforward interpretation of scientific data. No interpretation of scientific data is without bias, for all things must be understood in a context based upon one’s knowledge and experience. The real question is whether the bias is acceptable; because young-earth creationism is founded upon the Bible as the objective authority and because evolutionism is founded upon man’s subjective and ever-changing thinking, young-earth creationism has less human bias and is more reliable than evolutionism as a means of interpreting the scientific facts present in the universe.

Summary

Though evolutionism is widely espoused, evolutionism is not universally accepted as the mechanism for the origin of the universe, its contents, and life. Intelligent design advocates
rightly reject portions of evolutionism because of its scientific failings, but they wrongly leave out the necessity of God as the Creator. Old-earth creationists rightly reject portions of evolutionism because of its theological failings, but old-earth creationists wrongly compromise the Bible’s authority to combine evolutionism with scripture. Young-earth creationists rightly reject evolutionism because they submit to the Bible’s authority as God’s written Word, and they easily support the Bible’s authority with scientific evidence. The question of Bible-based origins is a simple one: does the Bible reader believe that God directed the Bible’s writing through men, or does the reader believe instead that the Bible is a product of fallible man’s thinking? If God is the Author behind the writing, then the Bible can be trusted, and it can be understood as it is written—in all things, not just the creation account.

**Creationist Worldview Scale**

Because evolutionists do not have a clear understanding of creationist views, as shown in the Lawson and Worsnop study (1992), creationists developed the *Creationist Worldview Test* (CWT, Deckard, 1998), which was later revised and renamed the *Creationist Worldview Scale* (CWS). Evolutionary worldview instruments like those used in the Lawson and Worsnop study are naturalistic, and they ignore or minimize the spiritual aspects of worldview and therefore cannot adequately measure the application of worldview to spiritual topics such as origins (Fishman, 2009; NAS, 1998; Winslow, Staver, & Scharmann, 2011). Because worldview involves responses that are physical, mental, and spiritual, the CWS was designed to supply the spiritual measure lacking in secular instruments, particularly to address one’s range of belief in or adherence to a YEC worldview (Deckard, DeWitt, & Pantana, 2008; Deckard, Henderson, & Grant, 2002). Because evolutionist surveys and research ignore or minimize the spiritual measures, the CWS is a better instrument for measuring the spiritual aspect of origins, as well as
the physical and mental aspects that are involved in the science (Deckard, DeWitt, & Pantana, 2008).

**Factors composing creationist worldview**

The origins controversy is centered on two themes: science and theology. The science theme addresses the physical and mental aspects of empirical origins data, and the theology theme addresses the spiritual aspects affecting the interpretation of origins data. For many evolutionists, these two themes are distinct and separate, never to overlap in any scientific endeavor or discussion (Dawkins, 1996; Dawkins, 2003); and as a result, evolutionist researchers disregard or downplay the importance of non-materialistic viewpoints or presuppositions (belief in the spiritual and non-physical) when they measure worldview, particularly in the origins aspects of worldview (Ha, Haury, & Nehm, 2012; Rutledge & Warden, 2000; Trani, 2004). Because the creationist worldview incorporates acceptance of the spiritual aspects of the universe, a valid measurement of creationist worldview must also involve the measurement of theological beliefs (Reiss, 2010).

The CWS is based on the tenets of creationism developed and adopted by the Institute for Creation Research (ICR; Deckard, Henderson, & Grant, 2002). Morris (1980) distinguished a difference between *scientific creationism* and *biblical creationism*, stating that scientific creationism is based solely on scientific data and that biblical creationism is based solely on biblical revelation; and he developed nine tenets for each. Combining all 18 tenets into one body also combines the two creationism models into *scientific biblical creationism*, which the CWS assumes as its foundation because it addresses the spiritual aspect of worldview in addition to the physical and mental aspects (Deckard, Henderson, & Grant, 2002; Deckard & Sobko, 1998).
The tenets of creationism (Morris, 1980) support the creation model, which can be summarized into the following outline:

- The universe’s origin was supernatural and is completed;
- The complexity of the universe is decreasing; and
- Earth’s geologic history is filled with catastrophes.

The creation model stands in direct opposition to the evolution model, which Morris (1980) also summarized into an outline:

- The universe’s origin was naturalistic and is ongoing;
- The complexity of the universe is increasing; and
- Earth’s geologic history is consistent with uniformitarian principles.

For a complete listing and explanation of the tenets of creationism, see Morris (1980).

As demonstrated by the creationist and evolutionist models above, there exist distinct differences between the creationist and evolutionist worldviews in three important areas: theology, views of science, and the age of the earth (Deckard et al., 2003; Deckard, DeWitt, & Cargo, 2003; Henderson, Deckard, & DeWitt, 2003). The creationist model calls for a supernatural, non-physical origin of the universe and life; but the evolutionist model rejects the unseen supernatural and accepts only natural processes and empirical facts (Ayala, 2008; Dawkins, 1996; Dawkins, 2003; Deckard, Henderson, & Grant, 2002; NAS, 1998). As such, the creationist model presupposes a supreme being that possesses a power great enough to create and sustain the universe, its contents, and life; but the evolutionist model requires no theology, preferring atheism instead because no supreme being is necessary outside of the natural processes that directed the unlikely evolution of everything (Behe, 2006; Dawkins, 1996).

Because the creationist model recognizes the need for a supernatural origin of the universe, creationist scientists interpret scientific facts according to the biblical principles of order, purpose, and the curse of sin, particularly in the areas of biology and geology where much of the
creation-evolution controversy is most apparent. Left without purpose and order, the evolutionist model cannot describe why things work or exist as they do; and evolutionist scientists are constrained to interpret scientific data within the bounds of how things work according to natural laws. The creationist model places known history in juxtaposition with a literal interpretation of the Bible and accordingly presents a universe that was created with maturity—that is, the earth was created with the ability to sustain the lives of the living things created to inhabit it—and is 6,000 to 10,000 years old. In contrast, because the evolutionist model rejects a supernatural beginning to the universe, evolutionist scientists are forced to interpret scientific data according to ever-changing theories in order to fit minute and random changes into a series of natural processes that require hypothetical eons. Because of the vast differences between the creationist and evolutionist models, any attempt to measure creationist worldview will fall short without addressing the areas of age, science, and theology.

**CWS subscales**

To address the extent to which one holds to a young-earth creationist worldview, the CWS employs several types of statements that address the three factors composing a YEC worldview. The *age* subscale distinguishes old-earth creationists from young-earth creationists, the *science* subscale distinguishes those who interpret scientific facts through biblical principles from those who do not, and the *theology* subscale measures respondents’ adherence to the major doctrines of the Bible (Henderson, Deckard, & DeWitt, 2003).

**Age subscale.** Young-earth creationism holds to a literal interpretation of the Bible. A literal interpretation of the Bible involves a literal analysis of the available genealogies and biblical events. Matching biblical events with recorded history leads one to conclude that the creation week occurred between 6000 and 10,000 years ago. The CWS addresses respondents’
belief in the literal interpretation of the Bible by measuring the extent of respondents’ agreement with 11 statements:

- All things in the universe were made by God in six twenty-four hour days.
- Dinosaurs and man lived at the same time.
- Formation of sedimentary layers and canyons caused by the eruption of Mt. St. Helens supports a creationist model.
- Fossils should be dated according to the rocks in which they are found.
- God created land dinosaurs on the sixth day of Creation.
- Man has taken millions of years to get to his present form.
- Rocks should be dated according to the fossils found in them.
- Space, time and matter have always existed.
- The rock layers in the Grand Canyon show evidence of being rapidly laid down.
- The rocks and fossils show that the Earth is millions of years old.
- The universe has gone through many changes since it exploded into existence billions of years ago.

**Science subscale.** Young-earth creationism applies biblical principles to the interpretation of scientific facts. The study of God’s creation requires the presuppositions that truth is objective, that causes have predictable and discoverable effects, and that the universe operates according to natural and physical laws. The CWS addresses respondents’ application of biblical principles to the interpretation of scientific facts by measuring the extent of respondents’ agreement with 22 statements:

- Animals have the same reasoning ability as humans, but on a lower level.
- Biological life came from nonliving matter by chance.
- Biological life developed by a series of natural processes.
- Dinosaur fossil graveyards are evidence of catastrophic burial.
- Entropy (increasing disorder) and evolution are compatible.
- Evolution can be proven as a scientific fact.
- Examples of special design in nature can be explored scientifically.
- Fossils in the Grand Canyon layers reveal the exact geologic column proposed by most scientists.
- Genetic mutations have caused beneficial changes in living things.
- Geologic evidence indicates there was once a worldwide flood.
- Great quantities of sedimentary rock layers and fossils were deposited by a worldwide flood.
- In modern geology the present is the key to the past is an established fact.
- In time, humans will likely develop into a higher life form than what is known of now.
It is appropriate in scientific studies to consider Creation.

Life evolved from a simple cell to more complex organisms.

Life evolved slowly from a “primordial soup.”

Micro-evolution (small changes within a particular species) is evidence that macro-evolution (changes from “kind to kind”) has happened.

Plant life can experience emotions like anger and joy as humans do.

The Bible is scientifically correct.

The Creation model and the second law of thermodynamics are compatible.

The fossil record provides examples of transitional forms.

There is no evidence that life is continuing to evolve today.

**Theology subscale.** Young-earth creationism requires a belief in the Bible’s authority as God’s written Word. As such, creationism also implies a required belief in the other tenets of the Bible. Though interpretation of some tenets may vary, creationists of all faiths generally believe in the Bible’s major doctrines. The CWS addresses respondents’ belief in the authority of the Bible by measuring the extent of their agreement with 18 statements:

- A triune God—Father, Son, and Holy Spirit—all participated in the work of Creation.
- An eternal Creator supernaturally made the physical universe.
- Christians participate in subduing the Earth for God’s glory.
- Each of the major kinds of plants and animals were made functionally complete.
- Fellowship with the Creator requires belief and personal trust in Jesus Christ.
- Genesis chapters one through eleven lack historical truth.
- It is important to recognize Jesus Christ as the Creator.
- Man’s separation from God can only be remedied by Jesus Christ’s death and bodily resurrection.
- Man’s sin brought God’s curse of death and separation to all of His Creation.
- Nature reveals itself as the creator.
- Not all Christians have to share the gospel of Christ.
- The competent Creator made the universe for an ultimate purpose.
- The Creator continuously maintains all laws of nature.
- The first humans were specially created different from all other life on Earth.
- The original creation did not include disease, aging, and extinctions.
- There is not a real place of permanent suffering which is known as hell.
- There is only one eternal God who is the source of all being and meaning.
- Those who refuse to put their trust in Jesus Christ will spend eternity in hell.

**Summary.** The CWS is an appropriate instrument to measure YEC worldview because it addresses three important factors that distinguish the YEC model from the evolutionist model: age, science, and theology. The presupposed spiritual facets of creationism affect worldview
development, and these facets must be addressed in order to obtain a more complete picture of one’s worldview.

**CWS measurement**

The CWS uses a 5-point Likert scale to measure levels of agreement with its various statements. The CWS has a total of 51 statements, worded positively (in support of creationism) and negatively (in support of evolutionism). Respondents register their level of agreement using a five-point Likert scale (strongly agree to strongly disagree); responses to positively-worded statements are assigned values ranging from 5 for “strongly agree” to 1 for “strongly disagree,” and responses to negatively-worded statements are assigned values ranging from –5 for “strongly agree” to –1 for “strongly disagree.” Worldview scores are derived by adding the score for each statement, and the final scores can range from 100 to –100 (Deckard, Henderson, & Grant, 2002; Henderson, Deckard, & DeWitt, 2003).

Ray (2001) paired the CWS with the PEERS test (Smithwick, 1995) to determine the designations described by the CWS scores. The sum of the score values for each statement indicates one of four possible designations within each subscale; and worldviews are determined as follows: >70 indicates a *Biblical Theist*, 30-69 indicates a *Moderate Christian*, 0-29 indicates a *Secular Humanist*, and <0 indicates a *Socialist*. Though worldview has many components that are somewhat abstract, the CWS measures beliefs and attitudes by assessing levels of agreement and then assigning a numerical value, making usage of the CWS both feasible and useful (Boldrin & Mason, 2009; Bryant, 2011a; Forray & Woodilla, 2009; Kim, Nesselroade, & McCullough, 2009; Olivier, 2012; Paunonen & O’Neill, 2010).
Validity of the CWS

Validity is a measure of how appropriately or accurately a test score describes the quantity being measured (Gall, Gall, & Borg, 2007; Pallant, 2007). To develop a valid instrument, Deckard spent several years developing and testing the CWS. In the course of its validation, the CWS (in its previous form as the CWT) was reviewed by experts at the Institute for Creation Research (ICR) and field tested on a small group of people. Then, after revising some of the statements based on the field test, Deckard administered the CWS to a large group of high school students attending creationism sessions at ICR over the course of two years, and he used the individual scores to complete this phase of the validation process (Deckard & Sobko, 1998). After completing the validation process, Deckard completed the final revision and published the CWS. The validity of the CWS has also been supported by several other studies involving more high school students and college students (Deckard et al., 2003; Deckard, DeWitt, & Cargo, 2003; Deckard, Henderson, & Grant, 2002; Ray, 2001).

Validation via the MATE. Not only did Deckard validate the CWS in a creationist context, but Deckard, DeWitt, and Pantana (2008) validated the CWS by comparing it to an evolutionist instrument. As shown previously, the Measure of Acceptance of the Theory of Evolution (MATE; Rutledge & Warden, 1999) is a valid and reliable instrument for measuring evolutionary worldview; and Deckard, DeWitt, and Pantana showed that using the MATE to measure creationist worldview was possible by inverting the Likert scoring values. In their study of the MATE, Deckard, DeWitt and Pantana compared the evolutionary measures of the MATE to the creationist measures of the CWS and found that the MATE reliably measured creationist worldview. Because the MATE is a valid and reliable instrument and because the MATE and
CWS consistently measure creationist worldview, the MATE further validated the CWS as a measure of origins worldview.

**Reliability of the CWS**

Reliability describes the precision of a test, or how close a series of scores are to each other when given to the same respondents at different times (Gall, Gall, & Borg, 2007; Pallant, 2007). Cronbach’s alpha coefficient is a commonly-used reliability indicator (Pallant, 2007); and when Deckard and Sobko (1998) analyzed the CWS with Cronbach’s alpha, they found that the CWS (again, under the original title of CWT) had a high reliability ($\alpha = 0.9035$). Thus, the CWS as a whole effectively measures young-earth creationist worldview.

Not only is the CWS reliable as a whole in its measurement of YEC worldview, but it is also a reliable instrument for measuring the three factors composing YEC worldview: age, science, and theology. In a study of Christian college students ($N = 125$) taking an origins apologetics course, Deckard, DeWitt, and Cargo (2003) showed that the apologetics course produced statistically significant increases in favor of YEC worldview. Using the 95% confidence interval with a related paired-samples t-test, they also showed that the CWS reliably measured the science ($\alpha = 0.006$) and age ($\alpha < 0.001$) factors. The researchers attributed the unreliable measurement of the theology factor to the closeness of the pretest and posttest scores, a probable occurrence due to the high enrollment of Christian students at the Christian college; indeed, other studies (Deckard, Henderson, & Grant, 2002; Henderson, Deckard, & DeWitt, 2003) obtained similar results in various circumstances. Nevertheless, in a different study comparing Christian college students from two different semesters of the same origins apologetics course, Henderson, Deckard, and DeWitt (2003) used the squared correlation coefficient (coefficient of determination) to show that the CWS reliably measured all three
factors, though the theology factors again had the lowest reliability. Finally, though Ray (2001) regrouped the CWS statements involving science and age into the categories of biology and geology, he found that the CWS reliably measured the theology factor by using a Chi square analysis.

Summary

The CWS is appropriate for this study because it can reliably measure the YEC worldview addressed in all aspects of the origins discussion in the creation-evolution controversy. Much of the discussion is scientific, and both sides of the controversy agree on the objective, physical facts. However, it is the spiritual aspect behind the interpretation of these physical facts that separate evolutionists from creationists and that separate old-earth creationists from young-earth creationists. The CWS has been shown to be a valid and reliable instrument for describing the worldview held by its respondents.

Science Standing Against Evolution

A large portion of the current college population consists of the Millennial Generation (Bland et al., 2012; Hartman & McCambridge, 2011; Mechler, 2013). Reaching these college students requires knowing something about them. One of the main characteristics of the Millennials is their default skepticism: their tendency to question, doubt, or even reject accepted and authoritative truths (Twenge, 2006). In other words, Millennial college students do not believe something just because they have been told that it is so (Stewart, 2009). However, this does not necessarily pose a problem because college students are willing to be persuaded and because Millennial college students seem to be very open to persuasive discussion (Roehling et al., 2011). When Millennials observe that a problem exists, they want to solve it; and while they are oriented toward learning as a group, they want to solve the problem for themselves, often
without the direct intervention of an authority (Bland et al., 2012; Bourke & Mechler, 2010; Kaifi et al., 2012; Twenge, 2006; Smith, 2009). If teachers at Christian colleges can show their students that evolution has many inherent problems by providing the corresponding evidence, the students seem to be willing to listen and to be persuaded. The extent to which a student will be persuaded may depend on the depth to which he currently holds contrary or conflicting views (Hartman & McCambridge, 2011), but the Millennial college student will at least consider the information. Therefore, Christian colleges and Christian teachers have the burden to present scientific evidence that supports biblical authority, providing the opportunity for students to change or strengthen their belief in the Bible.

Though every study of any portion of the universe or its contents reveals the Creator and supports the Bible’s authority, current research in biology and geology is especially compelling. As Ray (2001) showed, the CWS can reliably measure respondents’ YEC worldview based on biology and geology subscales; therefore, when Christian institutions present scientific biological and geological evidences that support YEC principles through scientific interpretations, they can use the CWS to measure their students’ YEC worldviews. Because it is not the purpose of this project to disprove evolution—or even to present evidence in support of creationism—it is important to note that the research below is presented solely to show that evolutionism is not a proven fact of science; rather, especially in the fundamental areas of scientific research, creationism provides the superior explanations for why the universe exists as it does. When presented with the facts below, Christian college students can understand that evolutionism does not hold the answers to origins; young-earth creationism does.
Biology

While the biological evidence against evolutionism is plentiful and multi-faceted, perhaps the most impressive evidence arises from the existence of eukaryotes, cells that have a nucleus. One of the foundational evolutionary processes involves simple organisms evolving into complex organisms over long periods of time through generations of random mutations and the application of natural selection (Bapteste et al., 2009; Behe, 2006; Darwin 1859; Hall, 1999; Mayr, 2001; Nei, 2013; Vasilyeva & Stephenson, 2012). A significant step in this process is often overlooked because it requires a subtle, yet very important, assumption: the cells that form the simplest organisms have already evolved to the point that they contain cellular materials that can be further mutated to make more complex organisms. There are generally two types of cells: those with a nucleus are called eukaryotes, and those without a nucleus are called prokaryotes.

Because the prokaryote is a simpler type of cell, evolutionary theory predicts that the prokaryote should evolve into a eukaryote (Chen, Wang, & Zhang, 1997; Koll, 1992; Poole & Penny, 2007; Vesteg & Krajčovič, 2011); however, neither any fossil evidence nor any mechanism exists as evidence of eukaryote evolution.

No evidence of eukaryote evolution. Evolutionists predict that the prokaryote should evolve into a eukaryote, but no fossil evidence for this evolution exists. Scientists have discovered fossils of prokaryotes and eukaryotes along with many of the other well-known fossils, but they have not discovered any fossils linking the two in evolution from one to the other (Poole & Penny, 2007). Lane (2011) even stated that it is difficult to distinguish between prokaryote and eukaryote fossils—much less to follow a line of their evolution—and that the existence of an extinct line of eukaryote is simply not provable. According to Koll’s (1992) interpretation of the fossil record, assuming that he can clearly distinguish between the
prokaryote and eukaryote fossils, the eukaryotes and prokaryotes are the same or nearly the same age, which implies that the prokaryote existed at the same time as the eukaryote rather than evolving into the eukaryote. Lane (2011) also suggests that the prokaryotes might exist due to reductive (or downward) evolution from a more complex organism rather than the usual upward evolution, and Brasier et al. (2006) found no difference between modern prokaryotes and those dated at three billion years old; these two theories suggest that prokaryote evolution into a eukaryote would not have occurred because they were not made more fit for survival through any type of mutation. Thus, though evolutionists cite the fossil record as the source of evidence for eukaryote evolution, they have to admit that evidence in the fossil record of eukaryote evolution is “too meager” and “problematic” to determine their age or initial appearance (Koll, 1992). In reality, then, based on the fossil record, evolutionists cannot find evidence for eukaryotic evolution at all, and their theory of eukaryote evolution is unsupportable.

**No mechanism for eukaryote evolution.** Evolutionists predict that the prokaryote should evolve into a eukaryote, but no mechanism for this evolution exists. Several hypotheses have been developed to describe the evolution of the eukaryote from the prokaryote. Possibly the most common hypothesis involves a prokaryote absorbing or engulfing cellular material that organized into a nucleus, producing an original eukaryote ancestor that further evolved into other eukaryotes (Lang, Gray, & Burger, 1999; Poole & Penny, 2007). While some evolutionists (Gilbert & Cordaux, 2013) state that this absorption must have occurred in a long series of slow steps relatively recently, others (Koll, 1992; Lang, Gray, & Burger, 1999) insist that the evolution would instead require several “rapid burst[s] of evolution” or “sporadic” relationships to account for the incredible diversity of eukaryotic cells so close to the original simpler ancestor. Though this may seem inconsequential, it is interesting to note that, while evolutionists
deride Gould’s (2000) punctuated equilibrium hypothesis when it calls for bursts of evolution among species, these bursts of rapid evolution among different cells is suddenly somehow acceptable. Regardless of how long and when this absorption was supposed to have occurred, Vesteg and Krajčovič (2011) described the required steps as “highly improbable.” Poole and Penny (2007) also stated that the absorption required for eukaryote evolution has never been observed and that studies of modern cells show that the required processes simply do not occur; they further stated that not only do other hypotheses conflict, but they also “show a curious disregard for mechanism.”

Another theory regarding eukaryote evolution involves the transfer of cellular material and information from a prokaryote to a newly-evolved eukaryote. Stating that an original eukaryote existed—yet without describing how it evolved—evolutionists posited that recently-evolved eukaryotes received necessary information from prokaryotes by horizontal transfer, the transfer of genetic information between organisms that do not mate, such as bacteria and other prokaryotes (Gilbert & Cordaux, 2013; Lang, Gray, & Burger, 1999; Schönknecht, Weber, & Lercher, 2013). However, Bapteste et al. (2009) showed that the processes required for prokaryote-to-prokaryote evolution are nothing at all like the processes that are required for the evolution of a prokaryote into a eukaryote; Lane (2011) stated such a transfer of genetic information was “implausible”; and Gilbert and Cordaux (2013) admitted that not only do eukaryotes lack any method of horizontally transferring genetic information that would imply eukaryotes were related to prokaryotes and but also genes sequences common to both the prokaryotes and eukaryotes are not active in the eukaryotes. Though Gilbert and Cordaux did not address it, the presence of these inactive genes suggests that if the prokaryotes had passed any genetic information, the information was either immediately or quickly useless, a mechanism
which is not predicted or supported by evolutionary hypotheses. At the same time, while several mechanisms for the transfer of the required genetic information have been postulated, Schönknecht, Weber, and Lercher (2013) concede that no mechanisms for that transfer have been observed. Thus, at the end of the discussion, evolutionists find themselves building the evolution of the eukaryote on several “if this and if that” statements; and they have to admit that the evidence for these statements has not been observed (Chen, Wang, & Zhang, 2007; Gilbert & Cordaux, 2013; Lang, Gray, & Burger, 1999; Poole & Penny, 2007; Schönknecht, Weber, & Lercher, 2013).

**Summary.** Koll (1992) stated that the fossil record and molecular phylogeny (analyzing DNA differences to identify evolutionary relationships) should test each other. Either both are true and support each other, or the one disproves the other. It is evident from the small sample of evolutionary research above that both the fossil record and molecular phylogeny present evidence against evolution at the one of the most basic levels: if the nucleus-containing cells required by the smallest/simplest organisms cannot evolve, neither can the smallest/simplest organisms evolve. On a philosophical level, some scientists call for a pluralistic approach to evolutionism, but many evolutionists reject the idea that there might be many different processes involved in the overall evolution (Bapteste et al., 2009; Dupré, 1993; Kellert, Longino, & Walters, 2006).

**Biology and the CWS.** The creation model states that God made everything fully formed and fully functional during the six days of Creation. If God created everything fully formed and fully functional without the use of evolution, then even at the most basic level of life no one should expect to see the evolution of any organisms into any other organisms, nor should the fossil record present any evidence of any such evolution. Again, if God created everything
fully formed and fully functional without the use of evolution, then one would expect that modern organisms have the same characteristics as ancient organisms. Therefore, the lack of any evidence of prokaryote-to-eukaryote evolution in the fossil record and the lack of any evidence of a mechanism for such evolution support the creationist model.

The Creationist Worldview Scale (CWS) measures worldview based in biology. The CWS measures the effect of worldview on biology-related topics by asking respondents to state their level of agreement with several statements.

- Each of the major kinds of plants and animals were made functionally complete.
- Dinosaurs and man lived at the same time.
- Man has taken millions of years to get to his present form.
- Biological life came from nonliving matter by chance.
- Biological life developed by a series of natural processes.
- Genetic mutations have caused beneficial changes in living things.
- In time, humans will likely develop into a higher life form than what is known of now.
- Life evolved from a simple cell to more complex organisms.
- Life evolved slowly from a “primordial soup.”
- Micro-evolution (small changes within a particular species) is evidence that macro-evolution (changes from “kind to kind”) has happened.
- There is no evidence that life is continuing to evolve today.

In order to indicate strong agreement with any of these statements, students do not have to know all of the biological reasons that evolution could not or did not occur; nor do they have to know all of the answers to evolutionists’ biological questions for evolutionism or against creationism. Instead, students need to know that at no time in the past have simple prokaryotic cells ever evolved into complex eukaryotic cells, and modern prokaryotic cells have no mechanism by which they can ever evolve into complex eukaryotic cells. If the cells cannot evolve, there is no reason to imagine that the complex organisms consisting of these cells ever evolved either.
Geology

One of the foundational concepts in evolutionary geology is that the change of one species into another requires long periods of time, often called geologic ages (Cotner, Brooks, & Moore, 2009; Parker, 2011). Cotner, Brooks, and Moore (2009) showed that among college students, belief in an old earth is one of the primary obstacles to a belief in and acceptance of evolution. Perhaps the best evidence against evolution, then, is the simple evidence showing that the rocks cannot be as old as evolutionism predicts they must be.

Evidence of fast processes. The foundation of evolutionary geology is uniformitarianism, the idea that the observed rates of modern geologic processes are the same as the unobservable rates of ancient geologic processes (Brooks, 2011; Clary & Wandersee, 2014; Di Fate, 2011; Reed, 2011). However, when Mt. St. Helens erupted in 1980, the resulting formation of several geologic features showed that the earth’s geologic features are better described by catastrophic events that change the topography quickly, not the uniformitarian processes offered by evolution (Mortenson, 2004). Further, according to evolutionary geology, the depth of the sedimentary layer on the earth implies the collection and compaction of many ages’ worth of dust and dirt; but evolutionists have to admit that the layers tell an incomplete story because the layers are in patches, have gaps, are out of order, and have obvious signs of non-uniformitarian processes (Brooks, 2011; Heaton, 2009). In the face of these and many other evidences, evolutionists have to admit that “too many examples exist in which the present is not the key to the past” (Collins & Collins, 2012).

While evolutionists admit some of the problems inherent in evolutionary geology, they are quick to cover over these problems with theories that are controversial even among other evolutionists (Hill & Moshier, 2009). For instance, if evolutionism were true, the earth should
have some very old rocks; however, evolutionists cannot find rocks that are old enough to support the time required for the earth’s evolution. To address this lack, Brooks (2011) suggested that the earth was bombarded by space debris just like the moon was, changing the age of the observable rocks; yet, Brooks admits that, while the moon shows evidence of the bombardment, the earth does not. As another example, if the Colorado River formed the Grand Canyon through erosion, there should be massive deposits of debris at the mouth of the Colorado River; but the deposits are extremely small, and there is no evidence of a wash-out that could have pushed the deposits farther out to sea. To address the lack of the debris deposits, Hill and Moshier (2009) state that the deposits were not produced because the Colorado River did not carve out the Grand Canyon; instead, the Grand Canyon was formed when two smaller canyons combined into the current Canyon, and the Colorado River only smoothed their junction.

**Soft tissue in old rock.** Evolution requires geologic ages of hundreds of thousands to millions of years, which is long enough that rock layers should not contain any soft tissue that has not been petrified or fossilized. According to Nielsen-Marsh (2002), one of the “occupational hazard[s]” faced in the research of ancient biomolecules is the consistent failure to secure preserved specimens because these specimens generally degrade too much after about 6000 years to yield any beneficial, organic information. When this fact is paired with findings by scientists, the geologic ages prescribed by evolution are impossible. In 1997, Schweitzer and Staedter published their discovery of red blood cells in a fossilized leg bone from a *Tyrannosaurus Rex* that they had estimated to be 65 million years old. In 2005, Schweitzer et al. published their findings of blood vessels that were still flexible even though they were in dinosaur fossils that were supposed to be millions of years old. In 2007, Schweitzer et al. published another article describing their discovery of collagen fibers that made up a leg bone of
the fossilized *T-rex*. Finally, in 2009, Schweitzer et al. published that they found soft tissues in the bone fragments of a dinosaur thought to be 80 million years old. Therefore, if soft tissues cannot be preserved for more than a few thousand years, it is impossible that these soft tissues lasted for millions of years out in the hostile environment that evolutionary theory predicts for the early earth.

**Missing transitional forms.** The evolutionary tree of life traces the proposed evolution among various organisms, and part of an evolutionist’s goal is to fill in the evolutionary gaps from one organism to another by identifying *transitional forms*, organisms that link an ancestor to its descendent organism (Ahlberg & Clack, 2006; Dirks, 2010; Feofilova, 2001; Fischer & Steele, 2008; Kröeger, Vinther, & Fuchs, 2011). Given the millions of years evolutionism requires and the vast differences among even the most similar types of organisms, it is reasonable to hypothesize that these transitional forms must be abundant in the fossil record. However, while evolutionists claim to find transitional forms frequently (Greener, 2007; Sahni, 2006; Wood & Lonergan, 2008), a review of the literature regarding transitional forms shows that most of the claimed transitional forms are either misinterpreted, have the “wrong age,” or belong to modern stable organisms (Coates, Ruta, & Friedman, 2008; Feofilova, 2001; Kröeger, Vinther, & Fuchs, 2011; Poole & Penny, 2007; Quental & Marshall, 2010; Tattersall & Schwartz, 2008; Teske & Beheregaray, 2009 Wood & Lonergan, 2008). When faced with the lack of clear support from the fossils record, evolutionists are forced to admit that the wide gaps in the fossil record still exist (Ahlberg & Clack, 2006; Coates, Ruta, & Friedman, 2008; Kröeger, Vinther, & Fuchs, 2011; Poole & Penny, 2007; Tattersall & Schwartz, 2008).

Evolutionists have devised several theories to address the lack of transitional forms. Two common theories address mutations and the geologic ages, two of the three most important
concepts required by evolutionism. Gould and Eldredge (2000) suggested that, rather than evolving through small mutations over geologic ages, complex organisms evolved through rapid bursts of mutation, thereby reducing the number of transitional forms necessary to link one organism to the next and at the same time reducing the number of transitional forms available for fossilization. Rossbach (2006) stated that many transitional forms exist, but the geologic ages are so long and the changes are so small that the changes among organisms cannot be accumulated into one or even several distinct transitional forms. Fischer and Steele (2008) and Sober (2008) had similar reasoning as Rossbach, but they stated that the lack of transitional forms was to be expected because the presence of one transitional form required the need for two others: if A and E were related and if the transitional form C were found, then the transitional forms B and D must have also existed, thereby increasing the lack of transitional forms. Both of these theories have their obvious detractions. Mainstream evolutionism requires small, non-life-threatening mutations over long periods of time, which contrasts with Gould and Eldredge; and the geologic-ages effect prescribed by Rossbach, Fischer and Steele, and Sober would still produce large numbers of similar-looking transitional forms available for fossilization.

**Summary.** Evolutionary scientists face a credibility problem, and it is an understatement to say that the scientific support for evolutionism is slim or shaky. The main problem actually stems from the existence of a large amount of oppositional evidence. Darwin (1859) stated that his theory would be proven wrong if the fossil record did not contain the necessary evidence; and a sampling of evolutionists’ work shows that, whatever evolutionists might imagine about the age of the earth and whatever evolutionists might imagine about the sequence of evolution from one species to another, geology and the fossil record do not support their imaginings. By Darwin’s words, then, the theory of evolutionism must be false. However, because evolutionists
continue the discussion, it is easy to observe that their belief in evolutionism goes deeper than any adherence to physical facts or mental interpretations of those facts. Their belief in evolutionism is a spiritual matter—a matter of religion, not a matter of science.

**Geology and the CWS.** The creationist model presents a better framework than the evolutionist model for the Earth’s geology. According to the creationist model, God made everything between 6000 and 10,000 years ago; then, about 2000 years later, God flooded the entire earth because of man’s exceeding wickedness. The catastrophic flooding caused land upheaval, the death and burial of animals and plants, the extinction of animal groups, changes in geography and topography, and the commencement of an ice age (Morris & Whitcomb, 1961; Ross, 2009; Sibley, 2004). Evolutionists admit that fossils appear to have been laid down by water; after all, all fossils are found in sedimentary rock. The presence of soft tissue in fossilized remains shows that the original organisms were fossilized too recently to support millions of years of evolution, and the lack of any true transitional forms refutes the evolution of one organism into another. The creationist model simply makes more sense in light of the evidence—or lack of evidence for evolutionism—presented by the fossil record. In grudging agreement, Cotner, Brooks, and Moore (2009) stated, “Creationists’ explanations for life’s origin are easier to teach, learn and internalize than are scientific explanations that rely on an understanding of deep time [long geologic ages]” (p. 862).

The CWS measures worldview based in geology. The CWS measures the effect of worldview on geology-related topics by asking respondents to state their level of agreement with several statements.

- Formation of sedimentary layers and canyons caused by the eruption of Mt. St. Helens supports a creationist model.
- The rock layers in the Grand Canyon show evidence of being rapidly laid down.
- The rocks and fossils show that the Earth is millions of years old.
Dinosaur fossil graveyards are evidence of catastrophic burial.
Fossils in the Grand Canyon layers reveal the exact geologic column proposed by most scientists.
Geologic evidence indicates there was once a worldwide flood.
Great quantities of sedimentary rock layers and fossils were deposited by a worldwide flood.
In modern geology the present is the key to the past is an established fact.
The fossil record provides examples of transitional forms.

In order to indicate strong agreement with any of these statements, students do not have to know all of the geological reasons that evolution could not or did not occur; they do not have to know all of the answers to evolutionists’ geological questions for evolutionism or against creationism. Instead, students need to know that the theory of evolutionism is based in man’s naturalistic guesses and atheistic imaginings about the distant past, not in any empirical evidence.

Summary

The key components of evolution involve biology and geology, and neither science supports evolutionism. Biological evidence at the cellular level shows that evolutionism cannot be true because, if even relatively simple cells cannot evolve upward, then no possibility exists for more complex organisms to evolve upward. Geological evidence in the fossil record shows that evolution cannot be true because the earth’s features developed rapidly; the fossils of supposed early organisms still contain soft tissue, which makes them recent creatures rather than old ones; and the fossils record does not contain any transitional forms that indicate in any way one type of organism evolving into another. Whereas evolutionism is not supported by science, creationism is. When scientific data is interpreted according to a literal interpretation of Genesis, the data only provides evidence supporting creationism.

Summary

Worldview is the way a person interacts with and responds to the rest of the world. Because worldview is determined by one’s knowledge, beliefs, and experiences over the course
of his life, those who help a person in that development need to have a hand in guiding the acquisition and interpretation of knowledge, beliefs, and experiences. One of the last times a person will accept such life-altering guidance is during college, and one of the foundational parts of a person’s worldview involves origins, answering the question of where the universe and its contents came from. Therefore, an effective method of helping a college student develop his worldview is by measuring his current worldview regarding the creation-evolution controversy and addressing related topics. Because creationism is supported by the Bible and by science, while evolutionism is not supported by either, college students exposed to the evidence supporting creationism may be more likely to accept it and the Bible upon which young-earth creationism is based.
CHAPTER THREE: METHODS

Design

This study used a causal-comparative design. According to Gall, Gall, and Borg (2007), this design is appropriate when participants can be sorted into groups (or categories) described by the independent variable according to a nominal scale, such as gender. The causal-comparative design is used when researchers desire to know whether a cause and effect relationship between variables exists but are unable to manipulate the independent (causation) variable. The purpose of this non-experimental design was to determine whether a causal relationship existed between gender and YEC worldview.

The independent variable was gender, which was defined as male or female. The dependent variables were posttest age score, posttest science score, and posttest theology score, which were measured using the Creationist Worldview Scale (Deckard, 1998; Henderson, Deckard, & DeWitt, 2003). The age subscale distinguished old-earth creationists from young-earth creationists, the science subscale distinguished those who interpreted scientific facts according to biblical principles from those who did not, and the theology subscale measured respondents’ adherence to the major doctrines of the Bible (Henderson, Deckard, & DeWitt, 2003). Because the groups were not randomly assigned, this research design accounted for differences between the groups that were not due to the origins course (Gall, Gall, & Borg, 2007) by also using the covariates pretest age score, pretest science score, and pretest theology score.

Research Questions

The research questions for this study were:
RQ1: Is there a difference between the \textit{posttest age scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for mean \textit{pretest age scores}?

RQ2: Is there a difference between the \textit{posttest science scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for mean \textit{pretest science scores}?

RQ3: Is there a difference between the \textit{posttest theology scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for mean \textit{pretest theology scores}?

\textbf{Null Hypotheses}

The null hypotheses for this study were:

\textbf{H}_01: There is no statistically significant difference between the \textit{posttest age scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for \textit{pretest age scores}.

\textbf{H}_02: There is no statistically significant difference between the \textit{posttest science scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for \textit{pretest science scores}.

\textbf{H}_03: There is no statistically significant difference between the \textit{posttest theology scores} of male and female undergraduates who have taken a semester YEC origins course while controlling for \textit{pretest theology scores}. 
Participants and Setting

Population

The study took place during the Fall semester of 2015 and sought to discover information about Christian college students taking a young-earth creationist (YEC) origins course offered at a conservative Christian college in the Southeast. The college was an accredited, four-year, liberal arts institution that also offered residential and online graduate degrees. Approximately 4,500 residential students were enrolled in the undergraduate and graduate programs, with about 2,000 male students and 2,500 female students from all 50 states and many countries from around the world. As a religious institution, the college was non-denominational, ministering primarily to students from Protestant denominations; the administration, faculty, staff, and on-campus church generally adhered to the doctrines and practices representative of independent Baptist churches. The origins faculty attended the on-campus church for over 20 years and consisted of a male professor in his late 20s and a female professor in her late 30s; both professors had masters’ degrees in biology and taught college courses for several years. The students at a Christian college were chosen for this study because Christian colleges should present the most informed discussion of YEC origin beliefs as drawn from a literal interpretation of Genesis.

The data were collected in September and December, 2015. In the second class meeting, the course instructors explained the study to the enrolled students. Enrolled students completed the Creationist Worldview Scale (CWS) via Survey Monkey within the first week of the semester and during the last week of the semester before final examinations as part of the normal course requirements. After the students completed the survey, they were asked for permission to use
their responses in the study. For the sake of this study, a demographics section was included at
the beginning of the pretest CWS.

**Sample**

The sample consisted of students taking a YEC origins course. According to the course
description in the 2015-2016 undergraduate catalog, the origins course presented

“foundational concepts of origins from a Christian worldview. This specific study of
origins focuses on the Creation, the Fall, the Flood, and the Tower of Babel. Differing
views of origins will be evaluated using a biblical standard.”

Because this study involved students who volunteered to be in the study, a convenience sample
was used (Gall, Gall, & Borg, 2007). A total sample size of 315 was used. This exceeded the
minimum sample size of 166 participants for a medium effect size at the 0.5 alpha level for a
statistical power of 0.7 (Cohen, 1988). The sample consisted of 63 sophomores, 203 juniors, and
49 seniors. The ethnicities of the sample were 5% African American, 8% Asian, 74%
Caucasian, 7% Hispanic, 1% Native American, and 6% Other. The denominations of the sample
were 79% Baptist, 0% Church of Christ, 0.6% Church of God, 0.3% Lutheran, 0.6% Methodist,
15% Nondenominational, 1% Pentecostal, 1.6% Presbyterian, and 1.9% Other.

Descriptive statistics are presented in several tables. Table 3.1 shows the distribution of
sophomore, junior, and senior students who agreed to participate in the study. In addition to
their gender and classification, participants self-reported their majors (Table 3.2), number of
years enrolled at the Christian college (Table 3.3), ethnicity (Table 3.4), religious affiliation
(Table 3.5), type of secondary school (Table 3.6), and the gender of their origins course
professor (Table 3.7).
Table 3.1

*Participants by Gender and Classification*

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<th>Classification</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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</thead>
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<tr>
<td>Junior</td>
<td>96</td>
<td>107</td>
<td>203</td>
</tr>
<tr>
<td>Senior</td>
<td>19</td>
<td>30</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>167</td>
<td>315</td>
</tr>
</tbody>
</table>

Table 3.2

*Participants by Gender and Major*

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<th>Female</th>
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</tr>
</thead>
<tbody>
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<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Business</td>
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<td>37</td>
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<td>63</td>
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<tr>
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<td>0</td>
<td>13</td>
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<td>19</td>
<td>29</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>12</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
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<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Visual Arts</td>
<td>6</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Performing Arts</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>167</td>
<td>315</td>
</tr>
</tbody>
</table>

Table 3.3

*Participants by Gender and Years Enrolled*

<table>
<thead>
<tr>
<th>Years Enrolled</th>
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<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>13</td>
<td>37</td>
</tr>
<tr>
<td>2</td>
<td>68</td>
<td>83</td>
<td>151</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>59</td>
<td>107</td>
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<tr>
<td>4</td>
<td>8</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>167</td>
<td>315</td>
</tr>
</tbody>
</table>
Table 3.4

*Participants by Gender and Ethnicity*

<table>
<thead>
<tr>
<th>Ethnicity</th>
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<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Female</td>
</tr>
<tr>
<td>African American or Black</td>
<td>7</td>
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</tr>
<tr>
<td>Asian</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Caucasian</td>
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<td>122</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>167</td>
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</tbody>
</table>

Table 3.5

*Participants by Gender and Religious Affiliation*

<table>
<thead>
<tr>
<th>Religious Affiliation</th>
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<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Female</td>
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<tr>
<td>Baptist</td>
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<td>125</td>
</tr>
<tr>
<td>Church of Christ</td>
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<td>0</td>
</tr>
<tr>
<td>Church of God</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Lutheran</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Methodist</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nondenominational</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>Pentecostal</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Presbyterian</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>167</td>
</tr>
</tbody>
</table>

Table 3.6

*Participants by Gender and Secondary School*

<table>
<thead>
<tr>
<th>Schooling</th>
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<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Female</td>
</tr>
<tr>
<td>Home school</td>
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</tr>
<tr>
<td>Private, Christian</td>
<td>67</td>
<td>74</td>
</tr>
<tr>
<td>Private, non-Christian</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Public</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>167</td>
</tr>
</tbody>
</table>
Table 3.7

*Participants by Gender and Professor Gender*

<table>
<thead>
<tr>
<th>Professor Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>60</td>
<td>74</td>
<td>134</td>
</tr>
<tr>
<td>Female</td>
<td>88</td>
<td>93</td>
<td>181</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>148</strong></td>
<td><strong>167</strong></td>
<td><strong>315</strong></td>
</tr>
</tbody>
</table>

**Male group.** The study had a total of 148 male participants. The ethnicities of the sample were 4.7% African American or Black, 7.4% Asian, 76% Caucasian, 6.1% Hispanic, 0.07% Native American, and 5.4% Other. The denominations of the sample were 84% Baptist, 0.0% Church of Christ, 0.0% Church of God, 0.7% Lutheran, 0.7% Methodist, 10% Nondenominational, 1.4% Pentecostal, 0.7% Presbyterian, and 2.7% Other.

**Female group.** The study had a total of 167 female participants. The ethnicities of the sample were 5.4% African American or Black, 7.8% Asian, 73% Caucasian, 7.2% Hispanic, 0.6% Native American, and 6.0% Other. The denominations of the sample were 75% Baptist, 0.0% Church of Christ, 1.2% Church of God, 0.0% Lutheran, 0.6% Methodist, 19% Nondenominational, 0.6% Pentecostal, 2.4% Presbyterian, and 1.2% Other.

**Instrumentation**

The instrument used in this study was the *Creationist Worldview Scale* (CWS). See Appendix B for the instrument and Appendix D for permission to use the instrument. The CWS was developed by Deckard (1998), and it was used to measure the dependent variables *posttest age score, posttest science score*, and *posttest theology score*.

**Development**

The purpose of the CWS was to measure respondents’ scientific and religious aspects of YEC worldview without requiring specific science knowledge (Deckard, 1998). Before the
CWS was published, Deckard and Sobko (1998) found that there existed a significant need to develop a consistent presentation of YEC principles among Christians; and they determined that part of developing a consistent and biblical YEC worldview involved accurately measuring that YEC worldview with a reliable and valid instrument. At its initial publication, the instrument was originally called the *Creationist Worldview Test*, but Deckard replaced *Test* with *Scale* to remove the implication that the instrument measured knowledge rather than belief (Deckard, 2014). Deckard spent two years validating the instrument via pilot studies and expert panels; and since its publication, the CWS has been used in many studies with high school students (Deckard & Sobko, 1998; Deckard et al., 2003) and college students (Deckard, DeWitt, & Cargo, 2003; Deckard, DeWitt, & Pantana, 2008; Henderson, Deckard, & DeWitt, 2003).

The CWS was broken down into three subscales: *age*, *science*, and *theology*. The *age* subscale distinguished old-earth creationists from young-earth creationists, the *science* subscale distinguished those who interpret scientific facts according to biblical principles from those who do not, and the *theology* subscale measured respondents’ adherence to the major doctrines of the Bible (Henderson, Deckard, & DeWitt, 2003).

**Validity and Reliability**

**Validity.** Validity is a measure of how appropriately or accurately a test score describes the quantity being measured (Gall, Gall, & Borg, 2007; Pallant, 2007). To ensure content validity, the CWS was reviewed by content experts at the Institute for Creation Research (ICR) and was then field tested on a small group of people. After revising some of the statements based on the field test, Deckard administered the CWS over the course of two years to high school students attending creationism sessions at ICR (Deckard & Sobko, 1998). Ray (2001) further validated the CWS by comparing it with the PEERS (Smithwick, 1995), a worldview
instrument that measures the extent of respondents’ biblical attitudes toward political, economic, educational, religious, and scientific topics; and Deckard, DeWitt, and Pantana (2008) validated the CWS by comparing it to the *Measure of Acceptance of the Theory of Evolution* (MATE; Rutledge & Warden, 1999), an evolutionist instrument used to measure the extent of respondents’ evolutionist worldview.

**Reliability.** Reliability describes the precision of a test, or how close a series of scores are to each other when given to the same respondents at different times (Gall, Gall, & Borg, 2007; Pallant, 2007). Cronbach’s alpha coefficient is a commonly-used reliability indicator (Pallant, 2007); and when Deckard and Sobko (1998) analyzed the CWS with Cronbach’s alpha, they found that the CWS had a high reliability (α = 0.9035). Henderson, Deckard, and DeWitt (2003) used the squared correlation coefficient (coefficient of determination) to show that the CWS reliably measured all three YEC worldview factors: the theology coefficient was 8 (Sig. < 0.0005), the science coefficient was 26 (Sig. < 0.0005), and the age coefficient was 28 (Sig. < 0.0005).

**Measurement**

The CWS used a 5-point Likert scale to measure levels of agreement (strongly agree to strongly disagree) with its various statements. The Likert-style scale is appropriate for this instrument because its range is based on and anchored in opposite opinions (Rovai, Baker, & Ponton, 2013). Responses to creationist statements were assigned values ranging from 5 for “strongly agree” to 1 for “strongly disagree,” and responses to evolutionist statements were assigned values ranging from –5 for “strongly agree” to –1 for “strongly disagree” (Deckard, Henderson, & Grant, 2002; Henderson, Deckard, & DeWitt, 2003). Of the 51 statements in the complete instrument, 11 statements addressed respondents’ beliefs about the age of the earth, 22
statements addressed respondents’ beliefs about science, and 18 statements addressed
respondents’ beliefs about theology.

**Negative wording.** For a self-reporting survey to be useful, its respondents must
accurately describe themselves. Several of the CWS statements were in line with YEC
principles that are founded upon a literal interpretation of Genesis and a biblical interpretation of
scientific data. From the standpoint that the CWS measured creationist worldview, these
creationist statements were considered to be positively worded and included statements such as
“A competent Creator made the universe for an ultimate purpose” and “All things in the universe
were made by God in six twenty-four hour days.”

When respondents complete a survey containing information they generally agree with,
they may become accustomed to registering similar levels of agreement as they proceed through
the survey. By constantly agreeing, respondents may demonstrate “acquiescence” or “yes-
saying” bias, either registering more agreement than they actually possess or registering
agreement with a statement when they might actually disagree (Van Sonderen, Sanderman, &
Coyne, 2013; Warner & Shields, 2013). The use of negatively worded statements helps to
identify inattentive respondents (Van Sonderen, Sanderman, & Coyne, 2013) and to reduce the
bias due to general agreement (Warner & Shields, 2013). To reduce potential yes-saying bias,
the CWS used positively worded statements in support of creationism and negatively (or
reversely) worded statements in support of evolutionism. Accordingly, the CWS used negative
wording by supplying evolutionist statements such as “In modern geology the present is the key
to the past is an established fact” and “Man has taken millions of years to get to his present
form” and by supplying other unbiblical statements such as “Genesis chapters one through
eleven lack historical truth” and “There is not a real place of permanent suffering which is
known as hell.” Of the 51 CWS statements in the complete instrument, 24 were negatively stated (i.e. 15, 16, 17, 22, 23, 27, 28, 29, 30, 34, 35, 38, 39, 40, 43, 44, 45, 46, 47, 48, 54, 57, 58, 60).

**Administration.** The CWS can be administered in a classroom setting as a pencil-and-paper instrument or via any online survey delivery platform as an online instrument. In either instance, the CWS takes 20–60 minutes to complete. Because the CWS measured respondents’ YEC worldview, a somewhat controversial topic, the instrument should be completed when respondents do not feel pressured or constrained to respond a certain way or indicate some level of agreement that they do not actually hold (Desimone, Smith, & Frisvold, 2010). Anseel et al. (2010) found that respondents self-report most honestly when they feel a sense of anonymity; and for students, that can occur whether they are surrounded by many others in a classroom setting or when they are alone in a private setting (Anseel et al., 2010). In this study, the CWS was delivered to the students via email link to Survey Monkey so that they could complete the survey when they did not feel constrained by time or by the presence of others. Using the online platform also allowed for conversion into a spreadsheet format, which further allowed the researcher to quickly tally the subscale scores and analyze the data in SPSS.

**Procedures**

After IRB approval for the study was obtained in Summer 2015, the researcher met with a college administrator to discuss the process for using the eligible students in the study. See Appendix A for IRB approval. The administrator agreed to allow the researcher access to the eligible students for the sake of the study. The study began in the Fall semester of 2015.

Before the beginning of the 2015 Fall semester and after obtaining the administrator’s approval, the researcher met with the course instructors to explain and discuss the study.
Completion of the CWS was a pre-existing course requirement for students enrolled in the origins course; however, for the sake of this study, a demographic portion was added to the CWS. The course instructors told the students about the survey on the second day of class and explained the study; the instructors explained that all students enrolled in the course would be emailed a link to the CWS and that completing the CWS was a pre-existing course requirement and needed to be completed regardless of the students’ participation in the study. Thus, inclusion in the study was voluntary, and responses were confidential. The instructors also read the letter of consent, telling the students that a complete version of the letter was also available online at the beginning of the survey. See Appendix C for the letter of consent. Once the students opened the email, they clicked the survey link; and the link took them to the consent pages. See Appendix E for the survey’s consent pages. After clicking to continue, students were taken to the introductory page, which required listing the students’ college ID number for the sake of matching pretest and posttest data. See Appendix F for the introductory page. Students who did not opt out of the study at the end of the survey affirmed their consent to be included in the study. After completing the introductory page, the student clicked to continue to complete the survey instrument. See Appendix B for the survey instrument. The survey instrument included both an 11-question demographic section and the 51-statement *Creationist Worldview Scale*. After being collected from Survey Monkey, students’ college ID numbers were coded and entered into an SPSS spreadsheet for analysis with their demographic data and test scores. See Appendix A for IRB approval.

To increase response rate and accurate responses, students were reminded that completion of the CWS was a course requirement but that inclusion in the study was voluntary and anonymous. Because the survey was a course requirement, no incentive was given for
completing the survey; however, students who voluntarily agreed to allow their data to be used in the study were entered into a drawing for one of several $20 gift cards (distributed through the college office based on the students’ identification number for anonymity) that could be used anywhere on campus.

When students clicked on the emailed link to complete the pretest survey, they were redirected to the survey in Survey Monkey. The first 11 items were demographic questions that students answered using preset multiple choices. To help ensure honest responses, students were asked whether their professor was male or female, and this response was matched between pretest and posttest to ensure that students were not purposefully skewing results. The remaining 51 statements each had 10 radio buttons that were numbered 1 to 10. At the end of the survey, respondents were instructed to check “I do not consent to be included in the study, nor do I wish to be entered into a drawing for one of several $20 gift cards” if they did not want to participate in the study, and then to click “Submit” to finish and submit the survey.

For the purposes of this study and with the author’s permission, the rating scale of the Creationist Worldview Scale (CWS) was converted from a five-point Likert scale to a 10-point integer rating scale. Integer rating scales are similar to Likert scales in that both can be used as psychometric rating scales; but whereas Likert scales have verbal descriptors for each number, the integer rating scale used in this study employed verbal descriptors only to anchor each end of the scale (Uebersax, 2006). The original five-point Likert scale was anchored at 1 with “strongly disagree” and at 5 with “strongly agree;” the values 2, 3, and 4 had the labels “disagree,” “neither disagree nor agree,” and “agree,” respectively. Because the CWS measures beliefs regarding biblical ideals and because the instrument was employed at a Christian college, it was reasonable to assume that the data collected from Christian college students would be positively skewed and
that a five-point scale would have low sensitivity as a result of the skew. However, as several studies have shown, increasing the number of response levels can minimize the skew. Greer et al. (2006) studied the effect of skew from non-normal distributions in Likert-type (such as the integer rating scale used here) studies on test-retest reliability values, and they found that they could increase an instrument’s reliability and reduce skew effects without sacrificing validity simply by (1) increasing the number of response levels rather than removing test items that had high skew values and by (2) transforming the skewed data via simple ranking. Also, Cummins and Gullone (2000) showed that up-scaling would increase an instrument’s sensitivity without significantly affecting its reliability. Last, Dawes (2008) showed that rating scales with a few response levels could be up-scaled without significantly changing the mean scores or variance; in fact, Dawes showed that any biasing effect in the mean score could be minimized by using negatively worded statements that are oppositely scored—a process which the CWS used. For these reasons, the CWS was administered with a 10-point integer rating scale to minimize the skew effect and to increase measurement sensitivity. The positively worded statements (in favor of creationism) were anchored and scored at 1 for “strongly disagree” and at 10 for “strongly agree”; the negatively worded statements (in favor of evolutionism) were anchored the same way, but they were oppositely scored with –1 for “strongly disagree” and with –10 for “strongly agree.”

In the last week of the course, students were emailed another link to take the posttest survey. The posttest procedure was similar to the pretest procedure. Enrolled students took the posttest as a course requirement, with the choice to withdraw participation. Students who voluntarily agree to participate in the study were entered into a drawing for another series of $20 gift cards.
The data was downloaded from Survey Monkey onto a secure, removable drive at the researcher’s premises. The data were coded to remove the original identification data, and the data were entered into an SPSS spreadsheet for analysis.

**Analysis**

The null hypotheses of this study involved determining whether the independent variable gender affected the dependent variables posttest age score, posttest science score, and posttest theology score. SPSS 23 was used to collate and analyze the data. In addition to the data regarding the independent variable, dependent variable, and covariate, demographic data were also collected for descriptive statistics such as ethnicity, denomination, major, secondary schooling, and years in college.

In this study, there may have been differences (a confounding variable or covariate) between the groups that were not associated with the independent variable; therefore, the participants were given a pretest to determine whether there existed any initial differences due to any confounding variables. Because it was necessary to account for and remove the effect of initial differences between groups, an ANCOVA was used to analyze null hypotheses (Gall, Gall, & Borg, 2007; Green & Salkind, 2011; Pallant, 2007). Also, Pallant (2007) stated that the ANCOVA was appropriate because randomization was not possible, as when using classes of students in educational research.

Using SPSS, the data underwent a preliminary screening according to procedures proposed by Pallant (2007) and Green and Salkind (2011). The pretest and posttest subscale scores collected from the respondents were assumed to be independent observations because students completed their surveys anonymously online so that they were not pressured or influenced by other students’ views or interactions. Box and whiskers plots of the independent
variable and dependent variables were examined for extreme outliers. Histograms of the data sets were visually evaluated for normal distribution, and the Kolmogorov-Smirnov statistic (> 0.05) was used to mathematically assess normality. Using a survey instrument with a high reliability (Cronbach $\alpha = 0.90$), the covariates (pretest scores) were measured before the origins course was well underway; and scatterplots were examined for linearity of each group of data presented by the dependent variables (posttest scores) and the covariates. A series of scatterplots of the covariates and the dependent variables were also examined for a cigar-shaped plotting to address the assumption of bivariate normal distribution. To meet the assumption of homogeneity of slopes, the scatterplots of each data set were also checked for interactions between the regression slopes of the dependent variables and the covariates. Levene’s test for equality (or homogeneity) of error variance was used to ensure the samples were drawn from populations of equal variance ($p > 0.05$).

After the ANCOVA assumptions were applied to the data, the data were analyzed using a one-way ANCOVA. To determine whether the null hypotheses should be rejected, this study used a traditional significance value of $p < 0.05$ to indicate a 95% confidence level that effects were not due to chance. Because three comparisons were being made and because the dependent variable was measured multiple times, a Bonferroni correction was made, and an alpha level of 0.0167 (two-tailed) was applied (Warner, 2013). Effect size was described using partial eta squared ($\eta^2$).
CHAPTER FOUR: FINDINGS

Research Questions

The research questions for this study were:

**RQ1:** Is there a difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest age scores*?

**RQ2:** Is there a difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest science scores*?

**RQ3:** Is there a difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for mean *pretest theology scores*?

Null Hypotheses

The null hypotheses for this study were:

**H₀1:** There is no statistically significant difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest age scores*.

**H₀2:** There is no statistically significant difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest science scores*.

**H₀3:** There is no statistically significant difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest theology scores*. 
Descriptive Statistics

Data were obtained for differences between male and female students’ age scores before and after enrollment in a YEC origins course. The covariate pretest age scores, dependent variable posttest age scores, and adjusted means for posttest age scores can be found in Table 4.1. Based on the descriptive statistics, both male and female students’ mean age scores increased from the pretest to the posttest due to their enrollment in the YEC origins course.

Table 4.1
Descriptive Statistics for Pretest and Posttest Age Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>S.D.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Age Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31.20</td>
<td>10.66</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>29.38</td>
<td>11.12</td>
<td>167</td>
</tr>
<tr>
<td>Posttest Age Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39.14</td>
<td>6.29</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>38.65</td>
<td>6.76</td>
<td>167</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>S.E.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates (with Adjusted Means)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>38.89</td>
<td>.49</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>38.87</td>
<td>.46</td>
<td>167</td>
</tr>
</tbody>
</table>

Data were obtained for differences between male and female students’ science scores before and after enrollment in a YEC origins course. The covariate pretest science scores, dependent variable posttest science scores, and adjusted means for posttest science scores can be found in Table 4.2. Based on the descriptive statistics, both male and female students’ mean science scores increased from the pretest to the posttest due to their enrollment in the YEC origins course.
Table 4.2

Descriptive Statistics for Pretest and Posttest Science Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>S.D.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Science Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39.70</td>
<td>18.62</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>40.08</td>
<td>16.83</td>
<td>167</td>
</tr>
<tr>
<td>Posttest Science Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48.70</td>
<td>14.02</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>50.06</td>
<td>12.78</td>
<td>167</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>S.E.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates (with Adjusted Means)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48.78</td>
<td>.92</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>49.98</td>
<td>.86</td>
<td>167</td>
</tr>
</tbody>
</table>

Data were obtained for differences between male and female students’ theology scores before and after enrollment in a YEC origins course. The covariate pretest theology scores, dependent variable posttest theology scores, and adjusted means for posttest theology scores can be found in Table 4.3. Based on the descriptive statistics, both male and female students’ mean theology scores increased from the pretest to the posttest due to their enrollment in the YEC origins course.

Table 4.3

Descriptive Statistics for Pretest and Posttest Theology Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>S.D.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Theology Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>126.41</td>
<td>10.88</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>127.81</td>
<td>8.75</td>
<td>167</td>
</tr>
<tr>
<td>Posttest Theology Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>128.19</td>
<td>9.48</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>130.72</td>
<td>6.92</td>
<td>167</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>S.E.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimates (with Adjusted Means)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>128.41</td>
<td>.63</td>
<td>148</td>
</tr>
<tr>
<td>Female</td>
<td>130.52</td>
<td>.60</td>
<td>167</td>
</tr>
</tbody>
</table>
Results

Data screening

The data for each group’s dependent variables (posttest age score, posttest science score, and posttest theology score) were initially screened for incomplete and repeated submissions and for student refusal to be included in the study. Of the 466 cases, 39 cases were removed because they were incomplete or repeated submissions or because the participants wished to be excluded from the study. The data for each group’s covariates (pretest age score, pretest science score, and pretest theology score) were also screened for incomplete and repeated submissions and for student refusal to be included in the study. Of the 676 cases, 129 cases were removed because they were incomplete or repeated submissions or because the participants wished to be excluded from the study. The data for each group’s dependent variables and covariates were also screened for unpaired dependent variable and covariate data. Of the 427 dependent variable cases, 87 cases were removed because they were not paired with covariate cases; of the 547 covariate cases, 107 cases were removed because they were not paired with dependent variable cases. After these cases were removed, 315 cases remained. The categorical data (gender, classification, major, years enrolled, ethnicity, religious affiliation, secondary school) were checked for errors by examining maximum and minimum nominal values. No data errors were found.

Assumption Tests for Null Hypotheses One

The data were analyzed according to an analysis of covariance (ANCOVA) for the first null hypothesis. The data for each group’s age score before and after the YEC origins course were screened for outliers using a box and whiskers plot. Several extreme outliers were identified in both the pretest age scores and the posttest age scores box and whiskers plots.
Because the extreme outliers were represented only at the low-score end in each plot, the extreme outliers (male: 1005, 1107, 1167, 1181, 1214, 1259, 1281, 1294, 1311, 1322; female: 1041, 1060, 1078, 1138, 1179, 1190, 1205, 1206, 1210, 1289) were removed from the data set. After removing the extreme outliers from each group, a secondary box and whiskers plot was screened for additional extreme outliers; and the additional extreme outliers (male: 1105, 1158; female: 1099, 1270, 1333) were removed from each group. Because remaining outliers were within a whisker’s length of the box, they were considered non-extreme and were retained (Green & Salkind, 2011). See Figure 4.1 for the final pretest age score box and whiskers plots and Figure 4.2 for the posttest age score box and whiskers plot.

*Figure 4.1. Distribution of pretest age scores for males (1) and females (2).*
The Kolmogorov-Smirnov statistic was used to assess the normality of each group’s data because the sample size was greater than 50 participants. The assumption of normality was not met among any of the groups. See Table 4.4 for the results of the Kolmogorov-Smirnov test.

Table 4.4

Kolmogorov-Smirnov Test of Normality for Posttest Age Scores

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Kolmogorov-Smirnov Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Age score</td>
<td>Male</td>
<td>.115</td>
<td>148</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>.094</td>
<td>167</td>
<td>.001</td>
</tr>
<tr>
<td>Posttest Age Score</td>
<td>Male</td>
<td>.220</td>
<td>148</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>.235</td>
<td>167</td>
<td>.000</td>
</tr>
</tbody>
</table>
To explore normality further, the researcher checked a series of histograms for both the covariate *pretest age score* and the dependent variable *posttest age score* for normality of distribution. Each group’s histogram did not show a normal distribution, violating the assumption of normality. See Figure 4.3 for the *pretest age score* histograms and Figure 4.4 for the *posttest age score* histograms.

*Figure 4.3. Histogram of pretest age scores for males (1) and females (2).*
Scatterplots comparing pretest age scores and posttest age scores among male and females were examined to test the assumptions of linearity and bivariate normal distribution. The scatterplots did not show any bivariate outliers. Also, the assumption of linearity was met. See Figure 4.5 for the scatterplots.

*Figure 4.4. Histogram of posttest age scores for males (1) and females (2).*
Figure 4.5. Scatterplots of posttest age scores vs. pretest age scores for males (1) and females (2).

The homogeneity of variance was checked using Levene’s test. The results were not significant ($p = 0.79$), and the assumption of equal variances was not violated. See Table 4.5 for the results of Levene’s test.

Table 4.5

<table>
<thead>
<tr>
<th>Levene’s Test of Homogeneity of Variance for Posttest Age Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: PostAgeScore</td>
</tr>
<tr>
<td>$F$</td>
</tr>
<tr>
<td>.070</td>
</tr>
</tbody>
</table>
Finally, the assumption of homogeneity of slopes was tested. The interaction was not statistically significant: $F(1, 311) = 2.42, p = 0.12$ with a small effect size ($\eta^2 = 0.01$) based on R squared; therefore, the assumption of homogeneity of slopes was not violated. See Table 4.6 for the homogeneity of slopes test.

Table 4.6

*Test of Homogeneity of Slopes for Posttest Age Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2524.101a</td>
<td>3</td>
<td>841.367</td>
<td>24.025</td>
<td>.000</td>
<td>.188</td>
</tr>
<tr>
<td>Intercept</td>
<td>34824.744</td>
<td>1</td>
<td>34824.744</td>
<td>994.416</td>
<td>.000</td>
<td>.762</td>
</tr>
<tr>
<td>Gender</td>
<td>75.967</td>
<td>1</td>
<td>75.967</td>
<td>2.169</td>
<td>.142</td>
<td>.007</td>
</tr>
<tr>
<td>PreAgeScore</td>
<td>2304.178</td>
<td>1</td>
<td>2304.178</td>
<td>41.183</td>
<td>.000</td>
<td>.175</td>
</tr>
<tr>
<td>Gender*PreAgeScore</td>
<td>84.606</td>
<td>1</td>
<td>84.606</td>
<td>2.416</td>
<td>.121</td>
<td>.008</td>
</tr>
<tr>
<td>Error</td>
<td>10891.315</td>
<td>311</td>
<td>35.020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>489571.000</td>
<td>315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>13415.416</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .188 (Adjusted R Squared = .180)

*Results for Null Hypothesis One*

Because the data did not violate the homogeneity of slopes, it was appropriate to analyze the data with ANCOVA (Green & Salkind, 2011). Therefore, an ANCOVA was conducted to determine whether there were statistically significant differences between the *posttest age scores* of male and female students while controlling for *pretest age scores*. Because the differences among groups were compared three times, a Bonferroni correction (.05/3 = .0167) was used to avoid Type I errors (Green & Salkind, 2011; Warner, 2013). Accordingly, the alpha level for each of the three comparisons was set to $\alpha = .0167$.

There was no significant difference between the adjusted *posttest ages scores* of male ($M = 38.89, SE = .49$) and female ($M = 38.87, SE = .46$) students, where $F(1, 312) = .001, p = .98, \eta^2$
= .000. The effect size was small. The researcher failed to reject null hypothesis one. See Table 7 for the results of the univariate test of the posttest age score.

Table 4.7

Results of ANCOVA of Posttest Age Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2439.496a</td>
<td>2</td>
<td>1219.748</td>
<td>34.672</td>
<td>.000</td>
<td>.182</td>
</tr>
<tr>
<td>Intercept</td>
<td>34940.408</td>
<td>1</td>
<td>34940.408</td>
<td>993.211</td>
<td>.000</td>
<td>.761</td>
</tr>
<tr>
<td>PreAgeScore</td>
<td>2421.233</td>
<td>1</td>
<td>2421.233</td>
<td>68.826</td>
<td>.000</td>
<td>.181</td>
</tr>
<tr>
<td>Gender</td>
<td>.027</td>
<td>1</td>
<td>.027</td>
<td>.001</td>
<td>.978</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>10975.920</td>
<td>312</td>
<td>35.179</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>489571.000</td>
<td>315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>13415.416</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .182 (Adjusted R Squared = .177)

Assumption Tests for Null Hypotheses Two

The data were analyzed according to an analysis of covariance (ANCOVA) for the second null hypothesis. The data for each group’s science score before and after the YEC origins course were screened for outliers using a box and whiskers plot. Several extreme outliers were identified in both the pretest science scores and the posttest science scores box and whiskers plots. Because the extreme outliers were represented only at the low-score end in each plot, the extreme outliers (male: 1005, 1107, 1167, 1181, 1214, 1259, 1281, 1294, 1311, 1322; female: 1041, 1060, 1078, 1138, 1179, 1190, 1205, 1206, 1210, 1289) were removed from the data set. After removing the extreme outliers from each group, a secondary box and whiskers plot was screened for additional extreme outliers; and the additional extreme outliers (male: 1105, 1158; female: 1099, 1270, 1333) were removed from each group. Because remaining outliers were within a whisker’s length of the box, they were considered non-extreme and were
retained (Green & Salkind, 2011). See Figure 4.6 for the final pretest science score box and whiskers plots and Figure 4.7 for the posttest science score box and whiskers plot.

Figure 4.6. Distribution of pretest science scores for males (1) and females (2).
Figure 4.7. Distribution of posttest science scores for males (1) and females (2).

The Kolmogorov-Smirnov statistic was used to assess the normality of each group’s data because the sample size was greater than 50 participants. The assumption of normality was not met among any of the groups. See Table 4.8 for the results of the Kolmogorov-Smirnov test.

Table 4.8

<table>
<thead>
<tr>
<th>Kolmogorov-Smirnov Test of Normality for Posttest Science Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Pretest Science score</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Posttest Science Score</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
To explore normality further, the researcher checked a series of histograms for both the covariate *pretest science score* and the dependent variable *posttest science score* for normality of distribution. Each group’s histogram did not show a normal distribution, violating the assumption of normality. See Figure 4.8 for the *pretest science score* histograms and Figure 4.9 for the *posttest science score* histograms.

![Histograms](image)

*Figure 4.8. Histogram of pretest science scores for males (1) and females (2).*
Figure 4.9. Histogram of posttest science scores for males (1) and females (2).

Scatterplots comparing pretest science scores and posttest science scores among male and females were examined to test the assumptions of linearity and bivariate normal distribution. The scatterplots did not show any bivariate outliers. Also, the assumption of linearity was met. See Figure 4.10 for the scatterplots.
Figure 4.10. Scatterplots of posttest science scores vs. pretest science scores for males (1) and females (2).

The homogeneity of variance was checked using Levene’s test. The results were not significant \( (p = 0.80) \), and the assumption of equal variances was not violated. See Table 4.9 for the results of Levene’s test.

Table 4.9

Levene’s Test of Homogeneity of Variance for Posttest Science Scores

<table>
<thead>
<tr>
<th>Dependent Variable: PostAgeScore</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.063</td>
<td>1</td>
<td>313</td>
<td>.801</td>
</tr>
</tbody>
</table>
Finally, the assumption of homogeneity of slopes was tested. The interaction was not statistically significant: $F(1, 311) = .27, p = 0.60$ with a small effect size ($\eta^2 = 0.00$) based on $R$ squared; therefore, the assumption of homogeneity of slopes was not violated. See Table 4.10 for the homogeneity of slopes test.

Table 4.10

*Test of Homogeneity of Slopes for Posttest Science Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>17245.221</td>
<td>3</td>
<td>5748.407</td>
<td>45.984</td>
<td>.000</td>
<td>.307</td>
</tr>
<tr>
<td>Intercept</td>
<td>55131.993</td>
<td>1</td>
<td>55131.993</td>
<td>441.028</td>
<td>.000</td>
<td>.586</td>
</tr>
<tr>
<td>Gender</td>
<td>92.345</td>
<td>1</td>
<td>92.345</td>
<td>.739</td>
<td>.391</td>
<td>.002</td>
</tr>
<tr>
<td>PreScienceScore</td>
<td>16977.289</td>
<td>1</td>
<td>16977.289</td>
<td>135.810</td>
<td>.000</td>
<td>.304</td>
</tr>
<tr>
<td>Gender*PreScienceScore</td>
<td>33.614</td>
<td>1</td>
<td>33.614</td>
<td>.269</td>
<td>.604</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>38877.465</td>
<td>311</td>
<td>125.008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>825429.000</td>
<td>315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>56122.686</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. $R$ Squared = .307 (Adjusted $R$ Squared = .301)

**Results for Null Hypothesis Two**

Because the data did not violate the homogeneity of slopes, it was appropriate to analyze the data with ANCOVA (Green & Salkind, 2011). Therefore, an ANCOVA was conducted to determine whether there were statistically significant differences between the *posttest science scores* of male and female students while controlling for *pretest science scores*. Because the differences among groups were compared three times, a Bonferroni correction ($.05/3 = .0167$) was used to avoid Type I errors (Green & Salkind, 2011; Warner, 2013). Accordingly, the alpha level for each of the three comparisons was set to $\alpha = .0167$.

There was no significant difference between the adjusted *posttest science scores* of male ($M = 48.78, SE = .92$) and female ($M = 49.98, SE = .86$) students, where $F(1, 312) = .909, p =$
.34, $\eta^2 = .003$. The effect size was small. The researcher failed to reject null hypothesis two.

See Table 11 for the results of the univariate test of the posttest science score.

Table 4.11

*Results of ANCOVA of Posttest Science Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>17211.607$^a$</td>
<td>2</td>
<td>8605.803</td>
<td>69.004</td>
<td>.000</td>
<td>.307</td>
</tr>
<tr>
<td>Intercept</td>
<td>55113.420</td>
<td>1</td>
<td>55113.420</td>
<td>441.915</td>
<td>.000</td>
<td>.586</td>
</tr>
<tr>
<td>PreScienceScore</td>
<td>17065.640</td>
<td>1</td>
<td>17065.640</td>
<td>136.837</td>
<td>.000</td>
<td>.305</td>
</tr>
<tr>
<td>Gender</td>
<td>113.354</td>
<td>1</td>
<td>113.354</td>
<td>.909</td>
<td>.341</td>
<td>.003</td>
</tr>
<tr>
<td>Error</td>
<td>38911.079</td>
<td>312</td>
<td>124.715</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>825429.000</td>
<td>315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>56122.686</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^a$ R Squared = .307 (Adjusted R Squared = .302)

**Assumption Tests for Null Hypotheses Three**

The data were analyzed according to an analysis of covariance (ANCOVA) for the third null hypothesis. The data for each group’s theology score before and after the YEC origins course were screened for outliers using a box and whiskers plot. Several extreme outliers were identified in both the pretest theology scores and the posttest theology scores box and whiskers plots. Because the extreme outliers were represented only at the low-score end in each plot, the extreme outliers (male: 1005, 1107, 1167, 1181, 1214, 1259, 1281, 1294, 1311, 1322; female: 1041, 1060, 1078, 1138, 1179, 1190, 1205, 1206, 1210, 1289) were removed from the data set. After removing the extreme outliers from each group, a secondary box and whiskers plot was screened for additional extreme outliers; and the additional extreme outliers (male: 1105, 1158; female: 1099, 1270, 1333) were removed from each group. Because remaining outliers were within a whisker’s length of the box, they were considered non-extreme and were retained
(Green & Salkind, 2011). See Figure 4.11 for the final *pretest theology score* box and whiskers plots and Figure 4.12 for the *posttest theology score* box and whiskers plot.

*Figure 4.11. Distribution of pretest theology scores for males (1) and females (2).*
Figure 4.12. Distribution of posttest theology scores for males (1) and females (2).

The Kolmogorov-Smirnov statistic was used to assess the normality of each group’s data because the sample size was greater than 50 participants. The assumption of normality was not met among any of the groups. See Table 4.12 for the results of the Kolmogorov-Smirnov test.

Table 4.12

Kolmogorov-Smirnov Test of Normality for Posttest Theology Scores

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Kolmogorov-Smirnov Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest Theology</td>
<td>Male</td>
<td>.189</td>
<td>148</td>
<td>.000</td>
</tr>
<tr>
<td>score</td>
<td>Female</td>
<td>.175</td>
<td>167</td>
<td>.000</td>
</tr>
<tr>
<td>Posttest Theology</td>
<td>Male</td>
<td>.205</td>
<td>148</td>
<td>.000</td>
</tr>
<tr>
<td>Score</td>
<td>Female</td>
<td>.251</td>
<td>167</td>
<td>.000</td>
</tr>
</tbody>
</table>
To explore normality further, the researcher checked a series of histograms for both the covariate *pretest theology score* and the dependent variable *posttest theology score* for normality of distribution. Each group’s histogram did not show a normal distribution, violating the assumption of normality. See Figure 4.13 for the *pretest theology score* histograms and Figure 4.14 for the *posttest theology score* histograms.

*Figure 4.13. Histogram of pretest theology scores for males (1) and females (2).*
Scatterplots comparing pretest theology scores and posttest theology scores among male and females were examined to test the assumptions of linearity and bivariate normal distribution. The scatterplots did not show any bivariate outliers. Also, the assumption of linearity was met. See Figure 4.15 for the scatterplots.
The homogeneity of variance was checked using Levene’s test. The results were significant ($p = 0.01$), and the assumption of equal variances was violated. See Table 4.13 for the results of Levene’s test.

Table 4.13

*Levene’s Test of Homogeneity of Variance for Posttest Theology Scores*

<table>
<thead>
<tr>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.008</td>
<td>1</td>
<td>313</td>
<td>.009</td>
</tr>
</tbody>
</table>
Finally, the assumption of homogeneity of slopes was tested. The interaction was not statistically significant: $F(1, 311) = 1.42, p = 0.23$ with a small effect size ($\eta^2 = 0.005$) based on R squared; therefore, the assumption of homogeneity of slopes was not violated. See Table 4.14 for the homogeneity of slopes test.

Table 4.14

Test of Homogeneity of Slopes for Posttest Theology Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>15577.355</td>
<td>1</td>
<td>15577.355</td>
<td>15577.355</td>
<td>1.885</td>
<td>.171</td>
</tr>
<tr>
<td>Gender</td>
<td>111.709</td>
<td>1</td>
<td>111.709</td>
<td>111.709</td>
<td>1.885</td>
<td>.171</td>
</tr>
<tr>
<td>PreTheologyScore</td>
<td>2433.313</td>
<td>1</td>
<td>2433.313</td>
<td>2433.313</td>
<td>41.057</td>
<td>.000</td>
</tr>
<tr>
<td>Gender*PreTheologyScore</td>
<td>84.220</td>
<td>1</td>
<td>84.220</td>
<td>84.220</td>
<td>1.421</td>
<td>.234</td>
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<tr>
<td>Error</td>
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<td>59.266</td>
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<tr>
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<td>315</td>
<td></td>
<td></td>
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<tr>
<td>Corrected Total</td>
<td>21658.463</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .149 (Adjusted R Squared = .141)

Results for Null Hypothesis Three

Because the data did not violate the homogeneity of slopes, it was appropriate to analyze the data with ANCOVA (Green & Salkind, 2011). Therefore, an ANCOVA was conducted to determine whether there were statistically significant differences between the posttest theology scores of male and female students while controlling for pretest theology scores. Because the differences among groups were compared three times, a Bonferroni correction (.05/3 = .0167) was used to avoid Type I errors (Green & Salkind, 2011; Warner, 2013). Accordingly, the alpha level for each of the three comparisons was set to $\alpha = .0167$.

There was a significant difference between the adjusted posttest theology scores of male ($M = 128.41, SE = .63$) and female ($M = 130.52, SE = .60$) students, where $F(1, 312) = 5.87, p = .016, \eta^2 = .018$. The effect size was small, explaining only 1.8% of the variance in posttest
theology scores. The researcher rejected null hypothesis three. See Table 15 for the results of the univariate test of the posttest theology score.

Table 4.15

Results of ANCOVA of Posttest Theology Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
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<tr>
<td>Corrected Model</td>
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<td>1571.184</td>
<td>26.475</td>
<td>.000</td>
<td>.145</td>
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<tr>
<td>Intercept</td>
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<td>15614.536</td>
<td>263.108</td>
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<td>.457</td>
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<tr>
<td>PreTheologyScore</td>
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<td>2640.380</td>
<td>44.491</td>
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<td>.125</td>
</tr>
<tr>
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<td>348.228</td>
<td>5.868</td>
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<tr>
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<td>59.346</td>
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<tr>
<td>Corrected Total</td>
<td>21658.463</td>
<td>314</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

\textsuperscript{a}. R Squared = .145 (Adjusted R Squared = .140)

Additional Analyses

Additional analyses were conducted to determine whether the genders of the professors had an effect on the students’ worldview by their genders after taking a YEC origins course. Six additional research questions were explored. After the data were split according to the professors’ genders, the data were screened for additional extreme outliers using box and whiskers plots; several additional extreme outliers (male: 1188, 1232, 1235, 1247; female: none) were identified and removed before analysis. All assumption tests were run and evaluated, and an ANCOVA was used to test each research question. The following results were obtained.

Additional Analysis Question One: Is there a difference between the posttest age scores of male and female undergraduates who have taken a semester YEC origins course taught by a male professor while controlling for mean pretest age scores?

Additional Analysis Null Hypothesis One: There is no statistically significant difference between the posttest age scores of male and female undergraduates who have taken a
semester YEC origins course taught by a male professor while controlling for mean pretest age scores.

There was no significant difference between the adjusted posttest age scores of male (M = 40.08, SE = .67) and female (M = 39.76, SE = .58) students, where F(1, 127) = .127, p = .72, η2 = .001. The effect size was small. The researcher failed to reject Additional Analysis Null Hypothesis One. This means that male students and female students did not respond differently to the age aspect of the YEC origins education due to the professor’s gender as a male.

Additional Analysis Question Two: Is there a difference between the posttest science scores of male and female undergraduates who have taken a semester YEC origins course taught by a male professor while controlling for mean pretest science scores?

Additional Analysis Null Hypothesis Two: There is no statistically significant difference between the posttest science scores of male and female undergraduates who have taken a semester YEC origins course taught by a male professor while controlling for mean pretest science scores.

There was no significant difference between the adjusted posttest science scores of male (M = 52.94, SE = 1.17) and female (M = 52.52, SE = 1.01) students, where F(1, 127) = .08, p = .79, η2 = .001. The effect size was small. The researcher failed to reject Additional Analysis Null Hypothesis Two. This means that male students and female students did not respond differently to the science aspect of the YEC origins education due to the professor’s gender as a male.

Additional Analysis Question Three: Is there a difference between the posttest theology scores of male and female undergraduates who have taken a semester YEC origins course taught by a male professor while controlling for mean pretest theology scores?
**Additional Analysis Null Hypothesis Three:** There is no statistically significant difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course taught by a male professor while controlling for mean *pretest theology scores*.

There was no significant difference between the adjusted *posttest theology scores* of male ($M = 131.21, SE = .93$) and female ($M = 131.16, SE = .80$) students, where $F(1, 127) = .002, p = .97, \eta^2 = .00$. The effect size was very small. The researcher failed to reject Additional Analysis Null Hypothesis Three. This means that male students and female students did not respond differently to the theology aspect of the YEC origins education due to the professor’s gender as a male.

**Additional Analysis Question Four:** Is there a difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest age scores*?

**Additional Analysis Null Hypothesis Four:** There is no statistically significant difference between the *posttest age scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest age scores*.

There was no significant difference between the adjusted *posttest age scores* of male ($M = 38.51, SE = .66$) and female ($M = 38.44, SE = .66$) students, where $F(1, 177) = .005, p = .95, \eta^2 = .00$. The effect size was very small. The researcher failed to reject Additional Analysis Null Hypothesis Four. This means that male students and female students did not respond differently to the age aspect of the YEC origins education due to the professor’s gender as a female.
**Additional Analysis Question Five:** Is there a difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest science scores*?

**Additional Analysis Null Hypothesis Five:** There is no statistically significant difference between the *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest science scores*.

There was no significant difference between the adjusted *posttest science scores* of male (*M* = 47.37, *SE* = 1.27) and female (*M* = 48.28, *SE* = 1.25) students, where *F*(1, 177) = .26, *p* = .95, η² = .001. The effect size was small. The researcher failed to reject Additional Analysis Null Hypothesis Five. This means that male students and female students did not respond differently to the *science* aspect of the YEC origins education due to the professor’s gender as a female.

**Additional Analysis Question Six:** Is there a difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest theology scores*?

**Additional Analysis Null Hypothesis Six:** There is no statistically significant difference between the *posttest theology scores* of male and female undergraduates who have taken a semester YEC origins course taught by a female professor while controlling for mean *pretest theology scores*.

There was a statistically significant difference between the adjusted *posttest theology scores* of male (*M* = 127.21, *SE* = .83) and female (*M* = 130.06, *SE* = .82) students, where *F*(1, 177) = 6.04, *p* = .015, η² = .033. The effect size was small. The researcher rejected Additional
Analysis Null Hypothesis Six. This means that male students and female students may have responded differently to the *theology* aspect of the YEC origins education due to the professor’s gender as a female.
CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

The purpose of this causal-comparative study was to determine whether gender affected Christian college students’ young-earth creationist (YEC) worldview after their enrollment in a YEC origins course. The Creationist Worldview Scale (CWS) was used to compare YEC worldview scores on three subscales: age, science, and theology. There were 148 male students and 167 female students involved in the study, for a total of 315 participants. The data for pretest and posttest scores were analyzed for differences between the subscale scores of each gender. It is believed that male and female brains are different from each other in both chemistry and structure (Gurian, 2011). Accordingly, research has shown that male students and female students learn differently from each other, and research has also shown that this difference is demonstrated in the gendered response to science education and religion education (Hoffman & Bartkowski, 2008; Kenway & Gough, 1998; Mihladiz, Duran, & Dogan, 2011). Male students tend to respond more positively to science education, and female students tend to respond more positively to religion education (Desy, Peterson, & Brockman, 2009; Hoffman & Bartkowski, 2008; Nosek et al., 2009; Sikora & Pokropek, 2012). Because the origins discussion is an intersection of science and religion, this study sought to determine whether gender affected students’ responses to this type of worldview education.

Null Hypothesis One

The first null hypothesis stated there is no statistically significant difference between the posttest age scores of male and female undergraduates who have taken a semester YEC origins course while controlling for pretest age scores. The researcher failed to reject the first null
hypothesis, indicating that there was no significant difference in the adjusted posttest age scores due to the participants’ gender.

Several studies using the CWS (Deckard, DeWitt, & Cargo, 2003; Deckard et al., 2003; Deckard & Sobko, 1998; Henderson, Deckard, & DeWitt, 2003) have shown that students’ YEC worldviews were positively affected due to their enrollment in an origins course. However, this study did not find any gendered difference between students’ adjusted age scores after the course. The age subscale demonstrated how students applied a biblical interpretation of scientific facts to obtain an approximate age of the earth. Because the age subscale consisted of both science and religion facets, it is perhaps no surprise that the positive responses expected from each gender for each facet of the age subscale resulted in no significant differences between the groups.

While some studies (Deckard, DeWitt, & Cargo, 2003; Henderson, Deckard, & DeWitt, 2003) found that age scores significantly increased after enrollment in an origins course, none of those studies addressed whether gender affected those scores. While the literature has shown that there exists a clear a gendered response to both science education and religion education, there was no research regarding whether there existed a gendered response to the intersection of science and religion education. In this way, there was not a body of literature against which one might have compared the results of the gendered differences in adjusted posttest age scores. Therefore, this study may have added to the literature by showing that male students and female students gave equal value to the age portion of the origins education because male students found that the course contained a significant amount of science education applied to the use of theological ideals as a lens of interpretation and because female students found that the course
contained a significant amount of religion education applied to the interpretation of scientific facts.

**Null Hypothesis Two**

The second null hypothesis stated there is no statistically significant difference between the adjusted *posttest science scores* of male and female undergraduates who have taken a semester YEC origins course while controlling for *pretest science scores*. The researcher failed to reject the second null hypothesis, indicating that there was no significant difference in the adjusted *posttest science scores* due to participants’ gender.

Several studies using the CWS (Deckard, DeWitt, & Cargo, 2003; Deckard et al., 2003; Deckard & Sobko, 1998; Henderson, Deckard, & DeWitt, 2003) have shown that students’ YEC worldviews were positively affected due to their enrollment in an origins course. However, this study did not find any gendered differences between students’ *science scores* after the course. The *science* subscale was a measure of the students’ abilities to interpret scientific facts according to biblical principles. Because the *science* subscale is not a measure of respondents’ knowledge or direct application of scientific facts and concepts, it may be expected that the positive responses expected from each gender for each facet of the *science* subscale resulted in no significant differences between the groups.

Many studies have shown that, beginning as early as the elementary grades and extending through college, male students tend to respond more positively toward science education than do female students (Charles & Bradley, 2009; Desy, Peterson, & Brockman, 2009; Fouad et al., 2010; Gömleksiz, 2012; Sikora & Pokropek, 2012). The results of this study are not consistent with the literature regarding the gendered response to science education. This inconsistency may have been attributable to the fact that the *science* subscale was a measure of the students’
interpretation of scientific facts rather than a measure of scientific knowledge. Though knowledge of some scientific facts is an inherent part of interpretation, the CWS did not require the knowledge of specific origins-related facts; instead, the CWS presented the fact and asked for the respondents’ agreement or disagreement with an applied creationist or evolutionist interpretation. In this way, it may have been that the science subscale was a measure of a respondent’s willingness to interpret scientific facts or knowledge rather than the simple possession of scientific facts or knowledge, which was in line with Deckard’s (2014) explanation that the Creationist Worldview Scale was a measure of belief rather than a test of knowledge, as implied by the instrument’s original title Creationist Worldview Test.

**Null Hypothesis Three**

The third null hypothesis stated there is no statistically significant difference between the posttest theology scores of male and female undergraduates who have taken a semester YEC origins course while controlling for pretest theology scores. The researcher rejected the third null hypothesis, indicating that there was a significant difference between the adjusted posttest theology scores due to participants’ gender.

Several studies using the CWS (Deckard, DeWitt, & Cargo, 2003; Deckard et al., 2003; Deckard & Sobko, 1998; Henderson, Deckard, & DeWitt, 2003) have shown that students’ YEC worldviews were positively affected due to their enrollment in an origins course. This study supported this previous research by demonstrating that a YEC origins course affected the theology scores between male and female students at a conservative Christian college. A statistically significant difference between male and female students’ theology scores after the course was found, however; as measured by partial eta squared ($\eta^2 = .018$), gender accounted for
only 1.8% of the differences in the adjusted posttest theology scores, demonstrating a small effect size.

The theology subscale was a measure of the students’ adherence to the major doctrines of the Bible. The mean adjusted posttest theology scores for the male and female students ($M = 128.41, SE = .63$) and female ($M = 130.52, SE = .60$), respectively. From these results, it was clear that the YEC origins course had an effect on female students’ theology scores, indicating a marginally higher change in their beliefs regarding their adherence to major biblical doctrines due to the origins course.

The results of this study supported the literature. Hoffman and Bartkowski (2008) found that, across all denominations, females responded more positively than male students to religion education. Also, while religiosity was not synonymous with adherence to a certain theology, Hammermeister et al. (2005) showed that females tend to be more religious than males. Further, two central themes of young-earth creationism involve belief in the Bible as an authority and a literal interpretation of the Bible. Bartkowski and Hempel (2009) found that females had a greater tendency than males to believe that the Bible is inerrant, and Hoffman and Bartkowski (2008) found that females were more likely to interpret the Bible literally. Though this study supported the literature, it is again noted that the effect size was small, which may have been due to a ceiling effect: the very high pretest theology scores may have prevented a finer resolution in the posttest theology scores. Though Deckard, DeWitt, and Cargo (2003) did not address differences in theology scores due to gender in their study of university students enrolled in a YEC origins course, it was found that there was only a small gain in theology scores, a finding which they attributed to initially high pretest theology scores.
Conclusions

By stating that male and females are distinguished by their brain structures and brain chemistry, the gender theory developed by Gurian (2010) agreed with the biblical principle that females were created differently from males. Because males and females are different from each other biologically and neurologically, it is reasonable that they learn differently also (De Welde, 2014). Research has shown that males tend to be more logical and reasoned (Burke, 2014); and as a result, males may tend to respond more positively to science education than do females. On the other hand, research has also shown that females tend to be more in touch with emotion (Cuesta, 2014); and as a result, females may tend to respond more positively to religion education than do males (Hoffman & Bartkowski, 2008).

This study did not support prevailing gender theory because there was no significant difference between male and female students’ adjusted posttest age scores. The age score addressed the intersection of science and religion, and while there was no significant difference between the male and female students’ adjusted posttest science scores, there was a significant difference between male and female students’ adjusted posttest theology scores. Accordingly, gender theory predicted that there should be a significant difference between male and female students’ adjusted posttest age scores. There may have been several valid reasons for this apparent contradiction. First, the lack of significant differences may have been related to the small effect size shown by the differences in adjusted posttest theology scores: because so little of the difference between male and female students’ adjusted posttest theology scores was attributable to gender, the application of theological beliefs to inferring the earth’s age was not strong enough to cause a difference in the adjusted posttest age scores. Second, because the Christian college adhered closely to conservative Baptist principles—which included a young-
earth creationist worldview—and because the students taking the origins course were overwhelmingly Baptist (79%), it was reasonable to assume that students’ worldviews would align closely to young-earth creationist principles regardless of the students’ gender even before they enrolled in the YEC origins course. Third, because the course consisted of mostly junior and senior students who had attended the college for at least two years before enrolling in the origins course, it was also reasonable to assume that the students remained at the college because their worldviews were also conservative, were generally aligned with Baptist principles, and were therefore also reinforced through other courses and religion instruction that had nothing to do with the YEC origins course. Fourth, because the students’ worldviews may have been closely aligned with principles taught in the origins course, there may have been a ceiling effect that prevented greater differences due to enrollment in the YEC origins course. The age subscale had scores that ranged from a low score of −55 to a high score of 44, where a more positive score indicated a closer alignment to YEC worldview principles; the male and female mean pretest age scores were \( M = 31.20, \ SD = 10.66 \) and \( M = 29.38, \ SD = 11.12 \), respectively, and the mean adjusted posttest age scores for male and female students were \( M = 38.89, \ SE = .49 \) and \( M = 38.87, \ SE = .46 \), respectively. Such high pretest scores left little room for the development of differences between the genders’ posttest scores.

This study contradicted prevailing gender theory because male students did not have higher science scores than the female students. Part of science education was the development of evaluation and interpretation skills, and the science scores measured the extent to which a student could evaluate scientific facts and interpret them in light of biblical principles. According to gender theory, Christian male students should have been able to perform this task more competently than female students after completing the origins course, but they did not.
However, this apparent contradiction may have had less to do with the students’ genders and more to do with their preexisting worldviews. Because the students enrolled in the origins course had worldviews that were already closely aligned with YEC worldview principles, the male students’ worldviews were also aligned with the female students’ worldviews, preventing further differences due to the origins course. Further, in light of the close preexisting alignment between students’ worldviews and the college’s adherence to YEC worldview principles, there was the potential for a ceiling effect in students’ science scores. The science subscale had scores that ranged from a low score of −132 to a high score of 66, where a more positive score indicated a closer alignment to YEC worldview principles; the male and female mean pretest science scores were \( M = 39.70, \ SD = 18.62 \) and \( M = 40.08, \ SD = 16.83 \), respectively, and the male and female mean adjusted posttest science scores were \( M = 48.78, \ SE = .92 \) and \( M = 49.98, \ SE = .86 \), respectively. Thus, though the science scores for both genders showed a positive response to the scientific aspect of YEC origins education, the initially high pretest scores did not permit a significant amount of change. In fact, the pretest science scores and the posttest science scores were so negatively skewed for both male and female students that obtaining a normal distribution was impossible even with the removal of outliers.

This study supported prevailing gender theory because female students had statistically significantly higher theology scores than did the male students. Corresponding to the reasonable assumption that both male and female students would adhere closely to Baptist principles and YEC principles before enrolling in the origins course, there were only small differences between male and female students’ pretest theology scores: 126.41 and 127.81, respectively. Also, at the end of the course, not only did both genders respond positively to the religion aspect of the YEC origins education, but the female students demonstrated a slightly more positive response than
did the male students. Because different sections of the YEC origins course had a male and a
female teacher, it was reasonable to assume that the students did not respond to their theology
education based solely on their teacher’s gender. Therefore, though the effect size was small,
explaining only 1.8% of the difference between theology scores, this study clearly supported the
prediction offered by gender theory that female students would respond more positively to the
religion education facet of the origins course. The small effect size may be explained by the
close preexisting alignment between students’ worldviews and the college’s adherence to YEC
principles, producing a ceiling effect in the students’ theology score. The theology subscale had
scores that ranged from a low score of –48 to a high score of 136, where a more positive score
indicated closer alignment to YEC worldview principles. Because the male and female students’
adjusted mean posttest theology scores were \( M = 128.41, SE = .63 \) and \( M = 130.52, SE = .60 \),
respectively, the inability of having significantly higher scores may have reduced the possibility
for a larger effect size.

The additional analyses section of this study analyzed the subscale scores based on the
professors’ genders, and that analysis further contradicted prevailing literature regarding the
gendered responses to the age and science aspect of YEC origins education. When the posttest
age scores of the male professor’s students were analyzed, there was no significant difference
between the adjusted posttest age scores of male \( M = 40.08, SE = .67 \) and female \( M = 39.76, SE = .58 \) students; and when the posttest age scores of the female professor’s students were
analyzed, there no significant difference between the adjusted posttest age scores of male \( M =
38.51, SE = .66 \) and female \( M = 38.44, SE = .66 \) students. When the posttest science scores of
the male professor’s students were analyzed, there was no significant difference between the
adjusted posttest science scores of male \( M = 52.94, SE = 1.17 \) and female \( M = 52.52, SE =

1.01) students; and when the posttest science scores of the female professor’s students were analyzed, there was no significant difference between the adjusted posttest science scores of male ($M = 47.37, SE = 1.27$) and female ($M = 48.28, SE = 1.25$) students.

The analysis of students’ adjusted posttest theology scores departed from the rest of the study to a small extent. When analyzed separately from the female professor’s students, the responses from the male professor’s students also contradicted prevailing literature because there was no significant difference between the adjusted posttest theology scores of male ($M = 131.21, SE = .93$) and female ($M = 131.16, SE = .80$) students. However, the analysis of the female professor’s students supported prevailing literature because there was a statistically significant difference between the adjusted posttest theology scores of male ($M = 127.21, SE = .83$) and female ($M = 130.06, SE = .82$) students, though the effect size was small, explaining only 3.3% of the difference in adjusted posttest theology scores. This difference in significance may have been due more to differences in the students’ pretest theology scores than to any response to the professors’ genders: the pretest theology scores for the male professor’s male ($M = 127.84, SD = 9.21$) and female ($M = 129.07, SD = 7.99$) students were higher than the pretest theology scores for the female professor’s male ($M = 125.46, SD = 11.86$) and female ($M = 126.90, SD = 9.17$) students. This may indicate a ceiling effect because the male professor’s students already had slightly higher scores. Regardless, when compared to the 1.8% explanation of differences in the overall analysis, it is clear from the 3.3% explanation of differences here that the gender of the professor played at least a small role in the students’ response to the religion education in YEC origins education.
Implications

Overall, this study did not support the literature regarding the effect of gender on the YEC worldviews of male and female students after taking a YEC origins course. Regardless, there were still some implications worth noting.

Though differences due to gender were minimal, the YEC origins course did help students to further develop their YEC worldview according to biblical principles. The importance of training Christian students in young-earth creationist principles was underscored by the fact that the mean scores for all three subscales increased from pretest to posttest. For instance, while the difference in theology scores was predicted by gender theory and supported by the literature and though the pretest theology scores were very high, based on the descriptive statistics, the students’ theology scores did increase due to the origins course. In this way, the origins course at least reinforced previously-held worldviews by providing additional knowledge and insight, and the worth of giving Christian college students a Christian education was therefore evident.

A second implication of this study involves the sixth additional analysis hypothesis regarding the effect of the professor’s gender on students' theology scores. Though the effect size was small, explaining only 3.3% of the difference in male and female students’ adjusted posttest theology scores, it seems clear that female students may respond more positively to religion education when it is presented by a female professor. Though the conservative Baptist students, faculty, and administration would not infer from this analysis that the college should adopt female pastors, preachers, or Bible course teachers, the study may imply that a women’s Bible study could be centered on a YEC origins theme or a Bible-science theme; and it may be most effectively led by a female teacher.
Limitations

There were several limitations to this study. First, the study lasted 14 weeks, and the students involved in the study were aware of their involvement from the very beginning, which may have influenced their responses on the pretest and posttest surveys and may have influenced the attention paid to their instructors. To counter this limitation, the researcher used a survey instrument whose completion was a course requirement. The course instructors were very clear that participation in the study was both voluntary and anonymous, and the surveys were delivered as far apart from each other as possible.

Another limitation was generalizability to the population. First, the students involved in the study were not randomly chosen, nor were they randomly assigned to any group or section. In fact, a large percent of the students came from the Business (37%, n = 116) and Education (20%, n = 63) departments, which indicated that students of other majors were not scheduled to enroll in the origins course during the semester of the study. The lack of other majors’ representation in the sample may have reduced generalization to the population of the Christian college. In addition, the students’ majors may have been a confounding variable because more than 67% (n = 76) of the Business majors were male and almost 90% (n = 56) of the Education majors were female. While this distribution accounted for almost equal numbers of male (n = 86) and female (n = 93) students, there may have been a difference between the Fall 2015 Education courses and Business courses that affected the students’ posttest scores but had nothing to do with the YEC origins course. Second, because the sample consisted of a high number of Baptist (79%, n = 249) students, the results of this sample were not generalizable to the much wider population of Christian college students. Last, because most (74%, n = 234) of the students in the study were Caucasian, the results may not be generalizable to the wider
population of Christian college students because other Christian institutions had larger student bodies that were only 51% and 62% Caucasian (College Factual, 2016).

Also, the students may have experienced “survey fatigue,” a tendency to respond without critical thought (Lipka, 2011). The college asked students to complete several institutional surveys at the same time they were asked to complete the pretest CWS for the origins course. Because they had to complete several surveys within a short timeframe, the students may not have seriously considered their true beliefs when they marked their responses (Aust et al., 2013). Paired with the temptation to respond as they were “expected,” the students’ survey fatigue may have resulted in the high pretest scores, falsely reducing the effect of the YEC origins course and reducing the effect of the students’ genders. Because the researcher was unaware of the institutional surveys, there was no way to reduce their potential effect on the pretest scores.

Finally, the Creationist Worldview Scale may not have had the necessary resolution for studying students enrolled in a conservative Christian college. Most of the students involved in the study were from home schools (which tend to be religious, 37%), Christian schools (45%), and Baptist churches (79%). When several other studies (Deckard, DeWitt, & Cargo, 2003; Deckard et al., 2003; Deckard & Sobko, 1998; Henderson, Deckard, & DeWitt, 2003) also used the CWS to test the YEC worldviews of Christian students enrolled at a Christian institution, the students had primarily attended public schools and were from a much wider variety of religious affiliations. Foreseeing this problem of resolution, the researcher sought to study students attending the same type of institution, but was able to gain access only to students at the conservative college.
Recommendations for Future Research

Given the current tension between the evolutionist movement and religious bodies, it may not be possible to test the effect of gender on attitudes toward YEC worldview in a setting that is more secular than a Christian institution. However, similar research could be done more effectively by surveying freshmen students in their first semester at a Christian college to observe their gendered attitudes toward YEC worldview before their education and then at the end of the semester or at the end of the school year. Also, many Christian institutions that offer a YEC origins course have a much wider constituency that represent less consistently conservative beliefs, and students at these institutions could also be studied.

Because attitudes are not the only part of a biblical worldview, research could also be done regarding students’ gendered knowledge of YEC principles and facts before and after taking an origins course. While it is reasonable to assume that the knowledge of both male and female students would increase due to enrollment in the origins course, it may be interesting to discover whether males or females accommodate new origins information into their worldview more readily or reject it outright.

In 1992, Lawson and Worsnop published a study that compared students’ ability to think reflectively to their belief in evolutionism. Though it was not supported by their data, Lawson and Worsnop concluded that students who believed in special creation could not think as reflectively as students who believed in evolution. Further research comparing students’ scientific reasoning ability and their adherence to creationist or evolutionist principles could also be done using Lawson’s Classroom Test of Scientific Reasoning (CToSR, 2001) and Rutledge and Warden’s Measure of Acceptance of the Theory of Evolution (MATE, 1999), both of which are validated, highly respected, and often-used measurement instruments.
REFERENCES


Holy Bible (KJV).


Marrapodi, E. (2012). *A penguin in the garden: The theological implications of young earth creationism—Why they are winning* (Master’s thesis). The Graduate School of Arts and Sciences, Georgetown University, Washington, DC.


APPENDIX A: IRB Approval Letter

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

August 6, 2015

Sean S. Vinaja
IRB Exemption 2367.080615: The Effect of Gender on the Attitudes of Undergraduates toward Young-Earth Creationism after Enrollment in an Origins Course

Dear Sean,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.

Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

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

(434) 592–4054

LIBERTY
UNIVERSITY

Liberty University | Training Champions for Christ since 1971
APPENDIX B: Creationist Worldview Scale (CWS)

Demographic Questions

1. What is your gender?
   ○ Male
   ○ Female

2. What is your major?
   ○ Bible
   ○ Business
   ○ Education
   ○ Engineering
   ○ Humanities
   ○ Natural Sciences
   ○ Nursing
   ○ Visual Arts
   ○ Performing Arts
   ○ Other

3. What is your current college classification?
   ○ Freshman
   ○ Sophomore
   ○ Junior
   ○ Senior

4. How many years have you attended this college as an undergraduate student?
   ○ 1
   ○ 2
   ○ 3
   ○ 4
   ○ 5+

5. What is your ethnicity?
   ○ African American or Black
   ○ Asian
   ○ Caucasian
   ○ Hispanic
   ○ Native American
   ○ Other
6. What is your religious affiliation?
   - Baptist
   - Church of Christ
   - Church of God
   - Lutheran
   - Methodist
   - Nondenominational
   - Pentecostal
   - Presbyterian
   - Other

7. What type of schooling comprised most of your high school years?
   - Home school
   - Private, Christian
   - Private, non-Christian
   - Public
   - Other

8. Have you taken a college-level creationism course before?
   - Yes
   - No

9. Have you taken a high school-level creationism course before?
   - Yes
   - No

10. What is the gender of your professor?
    - Male
    - Female
    - I was not enrolled in the course

11. Which section were you enrolled in?
    - 1
    - 2
    - 3
    - I was not enrolled in the course
    - I don’t know
**Creationist Worldview Scale**

Mark your level of agreement with each statement below on a scale of 1 to 10, where 1 indicates strong disagreement and 10 indicates strong agreement.

12. A triune God—Father, Son, and Holy Spirit—all participated in the work of Creation.
   - strongly disagree (1)
   - strongly agree (10)

13. All things in the universe were made by God in six twenty-four hour days.
   - 1

14. An eternal Creator supernaturally made the physical universe.
   - 1

15. Animals have the same reasoning ability as humans, but on a lower level.
   - 1

16. Biological life came from nonliving matter by chance.
   - 1

17. Biological life developed by a series of natural processes.
   - 1

18. Christians participate in subduing the Earth for God’s glory.
   - 1

19. Dinosaur fossil graveyards are evidence of catastrophic burial.
   - 1

20. Dinosaurs and man lived at the same time.
   - 1

21. Each of the major kinds of plants and animals were made functionally complete.
   - 1
22. Entropy (increasing disorder) and evolution are compatible.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

23. Evolution can be proven as a scientific fact.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

24. Examples of special design in nature can be explored scientifically.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

25. Fellowship with the Creator requires belief and personal trust in Jesus Christ.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

26. Formation of sedimentary layers and canyons caused by the eruption of Mt. St. Helens supports a creationist model.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

27. Fossils in the Grand Canyon layers reveal the exact geologic column proposed by most scientists.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

28. Fossils should be dated according to the rocks in which they are found.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

29. Genesis chapters one through eleven lack historical truth.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

30. Genetic mutations have caused beneficial changes in living things.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

31. Geologic evidence indicates there was once a worldwide flood.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

32. God created land dinosaurs on the sixth day of Creation.
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
33. Great quantities of sedimentary rock layers and fossils were deposited by a worldwide flood.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

34. In modern geology the present is the key to the past is an established fact.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

35. In time, humans will likely develop into a higher life form than what is known of now.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

36. It is appropriate in scientific studies to consider Creation.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

37. It is important to recognize Jesus Christ as the Creator.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

38. Life evolved from a simple cell to more complex organisms.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

39. Life evolved slowly from a “primordial soup.”
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

40. Man has taken millions of years to get to his present form.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

41. Man’s separation from God can only be remedied by Jesus Christ’s death and bodily resurrection.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

42. Man’s sin brought God’s curse of death and separation to all of His Creation.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

43. Micro-evolution (small changes within a particular species) is evidence that macro-evolution (changes from “kind to kind”) has happened.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
44. Nature reveals itself as the creator.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

45. Not all Christians have to share the gospel of Christ.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

46. Plant life can experience emotions like anger and joy as humans do.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

47. Rocks should be dated according to the fossils found in them.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

48. Space, time, and matter have always existed.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

49. The Bible is scientifically correct.
   1
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

50. The competent Creator made the universe for an ultimate purpose.
    1
    ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

51. The Creation model and the second law of thermodynamics are compatible.
    1
    ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

52. The Creator continuously maintains all laws of nature.
    1
    ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

53. The first humans were specially created different from all other life on Earth.
    1
    ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

54. The fossil record provides examples of transitional forms.
    1
    ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
55. The original creation did not include disease, aging, and extinctions.
   1 10

56. The rock layers in the Grand Canyon show evidence of being rapidly laid down.
   1 10

57. The rocks and fossils show that the Earth is millions of years old.
   1 10

58. The universe has gone through many changes since it exploded into existence billions of years ago.
   1 10

59. There is no evidence that life is continuing to evolve today.
   1 10

60. There is not a real place of permanent suffering which is known as hell.
   1 10

61. There is only one eternal God who is the source of all being and meaning.
   1 10

62. Those who refuse to put their trust in Jesus Christ will spend eternity in hell.
   1 10

*Published by Dr. S. Deckard (1998). Reproduced with permission (see Appendix D).
APPENDIX C: Consent Form

The effect of gender on the attitudes of undergraduates toward young-earth creationism after enrollment in an origins course

Sean S. Vinaja
Liberty University
School of Education

You are invited to be in a research study of the relationship between gender and worldview due to enrollment in a young-earth creationism course. You were selected as a possible participant because you are currently eligible for enrollment in [origins course] at [college]. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Sean S. Vinaja and the School of Education.

Background Information:

The purpose of this study is to determine whether gender affects Christian college students’ young-earth creationist worldview after their enrollment in a young-earth creationist course.

Procedures:

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

For enrolled students, there are no additional tasks or procedures required outside of class; all you have to do is complete the Creationist Worldview Scale (CWS) as one of your standard course requirements at the beginning and ending of the course. For non-enrolled students, completion of the CWS at the beginning and ending of the semester is extracurricular, and neither your participation nor your answers will affect any grade in any of your present courses in any way. For all students, the survey will take 20-60 minutes to complete each time you take it, and your participation in this study is both very important and much appreciated.
Please think critically and answer honestly about what you actually believe and think, not about what others say you should believe or what others expect you to believe.

**Risks and Benefits of Being in the Study:**

The study has risks that are no more than you would encounter in everyday life.

The benefits to participation are for future students. America needs Christian leaders who know that the Bible can be trusted as the foundational authority in all areas of life, and many of those leaders will gain their confidence in the Bible through courses that teach and discuss worldview. Your honest and thoughtful answers in this study will help educators to provide the best possible education to students so that they can have the best possible foundation for leadership positions that God has called them to.

**Compensation:**

Participants do not receive any compensation for participating in this study; however, all participants will be entered into a drawing for one of several $20 gift cards (one gift card for every twenty study participants) that can be used anywhere on campus. Winners of the drawing will receive their gift cards through the college Business Office within a week after the survey closes.

**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 any participant. Research records will be stored securely and only the researcher will have access to the records. While participants will mark their surveys with their ID numbers so that pre-course and post-course surveys can be compared and analyzed, the ID numbers will be coded at the conclusion of the study so that no personally identifiable information is retained with the surveys. The coded data
will be stored in an encrypted Word document that is accessible only to the researcher, and it will be used only as anonymous data in any type of publication. After three years, any and all data will be purged.

**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 enrollment with Liberty University or [college]. If you decide to participate, you are free to withdraw at any time without affecting those relationships. Enrolled students can opt out of the study by checking the “I do not consent to be included in the study, nor do I wish to be entered into a drawing for one of several $20 gift cards” box at the end of the survey. Eligible students who are not currently enrolled in CR 370 can signify their consent to participate in the study by clicking the “Next” button.

**Contacts and Questions:**

The researcher conducting this study is Sean S. Vinaja. You may ask any questions you have now. If you have questions later, you are encouraged to contact him at ssvinaja@liberty.edu. You can also contact Dr. Kurt Michael, the chair of the doctoral committee: kmichael9@liberty.edu.

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, Carter 134, Lynchburg, VA 24502 or email at irb@liberty.edu.

*Upon request, you will be given a copy of this information to keep for your records.*

**Statement of Consent:**
By not opting out of this study, you agree that you have read and understood the above information, you have asked questions and have received answers, and you consent to participate in the study.

Signature of Investigator:  Sean S. Vinaja  
Date:  September, 2015 

IRB Code Numbers: 2267

IRB Expiration Date: 8/6/2016
APPENDIX D: Permission to Use the Creationist Worldview Scale

Permissions to use the *Creationist Worldview Scale* (Deckard, 1998) for this study, to convert the original 5-point Likert scale to a 10-point bivalent scale, and to reproduce the CWS in Liberty University’s Digital Commons have been granted by Dr. Stephen Deckard, the primary author of the instrument, and by Dr. David DeWitt, a leading contributor to and researcher with the instrument. See the email correspondences below.

Permission from Dr. Stephen Deckard and Dr. David DeWitt to use the CWS:

**From:** Vinaja, Sean Stephen  
**Sent:** Monday, March 30, 2015 10:25 PM  
**To:** Steve Deckard  
**Subject:** Permission to use the Creationist Worldview Scale

Will you grant me permission to use the Creationist Worldview Scale for my dissertation study?

**From:** Steve Deckard  
**Sent:** Tuesday, March 31, 2015 9:32 AM  
**To:** Vinaja, Sean Stephen  
**Subject:** RE: Permission to use the Creationist Worldview Scale

I grant you permission.

**From:** David A. DeWitt  
**Sent:** Wednesday, April 1, 2015 7:41 PM  
**To:** Vinaja, Sean Stephen  
**Subject:** Permission to use the Creationist Worldview Scale

I will give permission.

Permission from Dr. Stephen Deckard to convert the 5-point Likert to a 10-point Likert:

**From:** Vinaja, Sean Stephen  
**Sent:** Wednesday, July 8, 2015 9:38 PM  
**To:** Steve Deckard  
**Subject:** Permission to use the Creationist Worldview Scale

I reviewed my procedures that involve expanding the current 5-point Likert scale to a 10-point scale (to increase resolution). I thought I had asked for permission to do so in our previous email thread, but I had not. Would you grant me that permission?
From: Steve Deckard  
Sent: Wednesday, July 8, 2015 10:55 PM  
To: Vinaja, Sean Stephen  
Subject: RE: Permission to use the Creationist Worldview Scale  

Permission granted.

Permission from Dr. Stephen Deckard and Dr. David DeWitt to reproduce the CWS:

From: Vinaja, Sean Stephen  
Sent: Thursday, April 14, 2016 8:53 PM 
To: Steve Deckard  
Subject: Permission to use the Creationist Worldview Scale  

Because I have appreciated your allowing me to use your survey, I would love to be able to reproduce it for anyone who reads my dissertation online. Are you willing to grant that permission?

From: Steve Deckard  
Sent: Thursday, April 14, 2016 9:58 PM  
To: Vinaja, Sean Stephen  
Subject: RE: Permission to use the Creationist Worldview Scale  

As far as I am concerned you have my permission.

From: David A. DeWitt  
Sent: Friday, April 15, 2016 12:09 PM  
To: Vinaja, Sean Stephen  
Subject: RE: Permission to reproduce the Creationist Worldview Scale  

I am ok with this.
APPENDIX E: Online Consent Pages

### CWS Pretest

1. Letter of Consent, page 1

The Effect of Gender on the Attitudes of Undergraduates toward Young-Earth Creationism after Enrollment in an Origins Course

Sean S. Vinaja
Liberty University
School of Education

Youler invited to be in a research study of the relationship between gender and worldview due to enrollment in a young-earth creationism course. You were selected as a possible participant because you are currently eligible to take either you are currently enrolled in or you are not enrolled in but meet the course prerequisites. I ask that you read this form and ask any questions you may have before agreeing to be in this study.

This study is being conducted by Sean S. Vinaja, a doctoral candidate in the School of Education at Liberty University.

**Background Information:**
The purpose of this study is to determine whether gender affects Christian college students' young-earth creationist worldview after their enrollment in a young-earth creationist course.

**Procedures:**
If you agree to be in this study, I would ask you to do the following things:
- Fill out a survey.
- Complete the CWS (Creation Worldviews Scale) as one of your standard course requirements at the beginning and ending of the course.
- Both your participation and your answers will affect your grade in any of your present courses in any way.
- Your participation in this study is both very important and much appreciated.

Please think critically and answer honestly about what you actually believe and think, not about what others say you should believe or what others expect you to believe.

---

### CWS Pretest

2. Letter of Consent, page 2

**Risks and Benefits of Being in the Study:**
The study has risks that are no more than you would encounter in everyday life. The benefits of participation are for future studies. America needs Christian leaders who know that the Bible can be trusted as the foundational authority in all areas of life, and many of those leaders will gain their confidence in the Bible through courses that teach and discuss worldview. Your honest and thoughtful answers in this study will help educators to provide the best possible education to students so that they can have the best possible foundation for leadership positions that God has called them to.

**Compensation:**
Participants do not receive any compensation for participating in this study; however, all participants will be entered into a drawing for one of several $20 gift cards (one gift card for every twenty study participants) that can be used anywhere on campus. Winners of the drawing will receive their gift cards through the college Business Office within a week after the survey closes.

**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 any participant. Research records will be stored securely and only the researcher will have access to the records. While participants will mark their surveys with their ID numbers so that pre-course and post-course surveys can be compared and analyzed, the ID numbers will be coded at the conclusion of the study so that no personally identifiable information is retained with the surveys. The coded data will be stored in an encrypted Word document that is accessible only to the researcher and it will be used only as anonymous data in any type of publication. After three years, any and all data will be purged.
CWS Pretest

3. Letter of Consent, page 3

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your relationship with Liberty University or Pensacola Christian College. If you decide to participate, you are free to withdraw at any time without affecting those relationships. Enrolled students can opt out of participation in the study by checking the "I do not consent to be included in the study, nor do I wish to be entered into a drawing for one of several $20 gift cards" box at the end of the survey. Eligible students who are not currently enrolled in CR 375 can signify their consent to participate in the study by clicking the "Next" button.

Contacts and Questions:
The researcher conducting this study is Sean S. Vinaja. If you have any questions or concerns regarding this study, you are encouraged to contact him at ssvinaja@liberty.edu. You can also contact Dr. Kurt Michael, the chair of the doctoral committee, kmichael6@liberty.edu. 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., Carter 104, Lynchburg, VA 24515 or email at irb@liberty.edu.

Statement of Consent:
By not opting out of this study, you agree that you have read and understood the above information, you have asked questions and have received answers, and you consent to participate in the study.

Signed: Sean S. Vinaja
Date: September, 2015
4. College ID number

Your college ID is necessary for record keeping and for your entrance into the drawing for a $20 gift card (if you agree to participate in the study); this information and your responses are strictly confidential. No attempt will be made to determine your identity.

* 1. Enter your college ID number.

* 2. Re-enter your college ID number.