A QUALITATIVE PHENOMENOLOGY OF CHRISTIAN MIDDLE SCHOOL IMPLEMENTATION OF INQUIRY-BASED SCIENCE INSTRUCTION

By

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Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this qualitative phenomenology study will be to explore curriculum coordinators, teachers, and principals' implementation of Inquiry-Based Instruction (IBI) in Christian middle school science classes in the central Virginia area. IBI will be referred to as "a teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p. 3). A qualitative phenomenology study will be made to consider the requirements and implementation of IBI in the Christian middle schools as compared to the requirements and implementation of IBI in the National Science Education Standard (NSES). Curriculum coordinators, teachers, and principals, participated in this study from five Christian middle schools in the central Virginia area. The guiding theories include John Dewey's (1948) Constructivism, Lev Vygotsky's (1998) Social Constructivism, and William Glasser's (2005) Choice Theory as they relate to the beliefs curriculum coordinators, teachers, and principals have regarding the implementation of IBI. A primary research question for this study is, "If research supports successful outcomes of IBI, then how and why do Christian middle school science teachers (CMSST), principals, and curriculum coordinators implement or not implement IBI?" Interviews, classroom observations, and document reviews were used for triangulation and data collection. The data analyses used in this study were completed by using Moustakas' (1994) seven step thematic coding derived from the observations, interview transcriptions, and school documents in the form of lesson plans and objectives (Merriam, 2009; Moustakas, 1994).

Keywords: Inquiry-Based Instruction, traditional instruction, constructivism, Choice Theory, hands-on learning, teacher beliefs, teacher choice, school environment

Dedication/Acknowledgments Page

God is my author and has led me to this point for which I am eternally grateful. This study would not have been possible without the support and sacrifice of my family who encouraged me to persistently persevere in the pursuit of higher education! Ron, my husband, always encouraged me to move to the next level of education; Ronisha, my oldest child, would not let me feel defeated; Ronell, my second child, always encouraged me with praise, and Rhonda, my youngest, would tangibly shut the office door and tell me to keep working! Last, my faithful parents: Dad and Mom prayed constantly for me and together provided Christian education all my life.

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List of Abbreviations

American Association for the Advancement of Science (AAAS)

Association of Christian Schools International (ACSI)

Attention Deficit Hyperactivity Disorder (ADHD)

Beliefs About Learning Environments (BALE)

Biological Science Curriculum Study (BSCS)

Choice Theory (CT)

Christian School One (CS1)

Christian School Two (CS2)

Christian School Three (CS3)

Christian School Four (CS4)

Christian School Five (CS5)

Classroom Learning Environment Survey (CLES)

Curriculum Coordinators (CC)

Institutional Review Board (IRB)

Inquiry-Based Instruction (IBI)

Christian middle school science teachers (CMSST)

Christian middle school science students (CMSSS)

National Science Education Standards (NSES)

National Research Council (NRC),

National Science Standards (NSS)

Nursery Kindergarten (NK)

Project Based learning (PBL)

Science for All Americans (SFAA)

Science, technology, engineering, mathematics (STEM)

The Science Management Observation Protocol (SMOP)

United States (US)

CHAPTER ONE: INTRODUCTION

Background

In the twentieth century science education, research indicates that a lack of Inquiry Based Instruction (IBI) within the teaching standards, may result in a decline in student motivation, interest, and learning (Vega & Brown, 2013; Zhao, 2011). Teacher and principal beliefs and choices in the classroom are based on several factors that may or may not be within the control of these two constituents. The traditional classroom is directly affecting student learning (Bhattacharyya, 2009; Vega & Brown, 2013). A probable cause for lack of student engagement may be contributed to teachers and students passively utilizing a textbook in a traditional classroom, instead of being actively engaged in interactive projects (Vega & Brown, 2013) such as IBI. IBI is often misunderstood as hands-on projects (Crawford, 2000), but it is much more. IBI is "A teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p. 3), coupled with constructivism which occurs when students construct understanding for themselves (Lowery, 1997). The National Research Council (NRC) is seeking ways to incorporate science reform in the 21st century science classes (NRC, 1996) to include IBI and constructivism.

To address the learning issue, the NRC (1996), the Science for All Americans (SFAA) (Rutherford & Ahlgren, 1993), along with the Biological Science Curriculum Study (BSCS) have recommended constructivism as "an intricate aspect of curriculum reform" (Haney, Czerniak, & Lumpe, 2003, p. 366). Constructivism in curriculum reform enhances the science student exhibition, and increased reasoning occurs when teachers exercise responsible choices (Shillingford & Edwards, 2008) to implement IBI, revealing higher motivation and learning in

the educational process (Thornton, 2012). Even though IBI can increase motivation and learning, Armstrong (1994), found that implementing constructivism may meet resistance when the traditionalists, those who view the classroom as rows of quiet students lectured by a teacher from the front of the classroom, view the constructivist ideologies as ineffective and disruptive.

Optional curricula or curricula reform, and teacher preparedness in IBI, may be a key to re-engaging the students who are bored in the traditional classroom (Glenn, 2000; Kanevsky & Keighley, 2003; Morman & Schild, 2011). With an appropriate IBI curriculum, Christian middle school science students (CMSSS) can develop the skills of investigation and the understanding that "scientific inquiry is guided by knowledge, observations, ideas, and questions" (NSES, 1996, p. 143); Henceforth, Crawford (2000), explains that IBI is recognized as "engaging students in the cognitive processes used by scientists" (p. 934). The purpose of this qualitative phenomenology study is to consider the curriculum choices made by curriculum coordinators, teachers, and principals regarding the implementation of IBI in five Christian middle schools in Central Virginia. With the lack of empirical rich description on the implementation of IBI in the Christian schools, a qualitative phenomenology is a valid study. There is substantial research to support that the IBI as presented in NSES (2015) is implemented and required in the public schools (NRC, 1996; AAAS, 1993, NSES, 2015), which exposes a gap in the literature regarding the implementation of IBI in the Christian middle school science curriculum, and gives significance to this study.

Historical

Education in the era of the 20th Century was effective, but as time progresses, the era of internet, knowledge, and technology is presenting a grim challenge for teachers in this 21st century. "Former conceptions of knowledge, minds and learning, no longer serve a world where

what we know is less important than what we are able to do with knowledge in different contexts" (Friesen, S. 2009, p. 4). Since the mid-1990s, there has been concern about schools implementing IBI (Pea, 2012). Moman and Schild (2011) report that in the past 20 years, science reform in the areas of science, technology, engineering, and mathematics (STEM) education has received national attention. Yagar and Akcay (2010) concur that IBI is a superior method of learning as opposed to the more traditional classroom when they said, "Research has shown that students taught using IBI significantly outperform students taught in more traditional ways" (Yagar & Akcay, 2010, p. 5). The proposed research is expected to extend or refine the existing knowledge of IBI implementation in the area of Christian middle school science curriculum.

Social

According to the Biological Science Curriculum Study (BSCS, 1994), "Constructivism is one of the primary strands guiding contemporary science reform" (Haney & Lumpe, 2003, p. 366). Many factors such as environment, policies, and building design either help or hinder the implementation of IBI among the CMSST (Pea, 2012). Inquiry succeeds best where there is support from the principal through professional development in training teachers to teach from a problem (Peled, Kali, & Dori, 2011) using the scientific method. Lowery (1997) stated, "Constructivism is a philosophy that, put simply, states that students construct understanding for themselves" (Haney & Lumpe, 2003, p 6). Constructivism uses tools, with teacher as facilitator, to present concepts which leads to assimilation and accommodation of new information (Collin, & Yound, 2013). CMSSTs are affected by this problem of learning without IBI since the traditional classroom is directly affecting the way students progress (Vega & Brown, 2013). Furthermore, Vega and Brown (2013) explore a possible cause of this problem may be that

students are passively learning from a textbook and are not actively engaged in constructivist, hands-on projects associated with scientific inquiry (Morman & Shield, 2011). Behavior problems, low test scores, and failing schools need to consider the benefits of IBI (Zhao, 2011). "Students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge" (Krajcik, 2010, p. 35). Teachers, curriculum coordinators, and principals may benefit from this proposed research to refine the learning standards in the Christian middle schools, to implement IBI, and to increase student engagement and progress in Christian middle school science students (CMSSS).

Theoretical

John Dewey (1938) who promoted a student-centered learning atmosphere recognized that, the educational process could be hindered through direct instruction and the traditional classroom experience. William Glasser (1998) portrays choices in education, for teachers, curriculum coordinators, and principals who have the option to choose the implementation of IBI. Choice Theory (CT), also known as Reality Therapy or Control Theory, evolved from William Glasser's (1998) proposal. CT suggests that people can control their choices and are motivated by five basic needs when making a choice: (a) survival, (b) love and belonging, (c) power, (d) freedom, and (e) fun (Glasser, 2005). Choosing a style of instruction, based on Lev Vygotsky's (1978) Social Constructivism, is another theoretical underpinning for this study.

Situation to Self

"The doctoral student is the director, data gatherer, and analyst for the study, but with a responsible advisor and committee, he or she gets help in interpreting observations and refining research questions" (Stake, 2005, p. 18). Being a Christian school teacher in the middle grades, and a Christian school secondary administrator in the past 20 years, I have witnessed how

success and behavior may be directly linked to the preparedness of the teacher and the nature of the lesson being presented. When students are less engaged, there are more behavioral issues with less conceptual understanding and achievement. A study about constructivism, choice, and IBI implementation in the middle school science classroom is the goal of this qualitative phenomenology study. Keeping students interested in learning science through the use of text books only, can be quite a daunting and exhausting task resulting in student boredom (Vega & Brown, 2013) with little retention of the concepts.

As a CMSSS, I struggled in science and biology because the teachers taught from a textbook with very little hands-on learning. Reading information, answering questions, taking notes, reading, rituals, recitation, and recall just became a barrage of words with little meaning. This was information overload with little assimilation and accommodation of concepts. For this reason, finding a better way to teach science courses carries a personal challenge to better meet the needs of all students. "Challenged with balancing theory and practice acquired through experience" (Onofowora, 2004, p. 34), Onofowora's (2004) observation is convincing with respect to using IBI which offers keys to success, student motivation, learning through curiosity, problems, and discovery (Thornton, 2012). The implementation of IBI in the classroom may be a challenge due to lack of teacher knowledge and professional development, funds, equipment, and facilities (Bandura, 1997; Ford, 1992). The challenge of implementing IBI is a driving motivator for this study, but where there is training and support from the principal, IBI has the opportunity to bring success for all involved (Onofowora, 2004).

Problem Statement

If inquiry through IBI is in the scope and sequence, the NSES, and the school objectives, then why are some teachers still teaching traditionally from a textbook, without the concrete

experiences of IBI? Traditionalism has the potential to negatively affect student motivation and learning (Bandura, 1997; Ford, 1992; Vega & Brown, 2013). "Over the past two decades, numerous national reports on the need for reform in education have focused on the concomitant need for reform in science, technology, engineering, and mathematics (STEM) education" (Moman & Schild, 2011, p. 47). If United States (U.S.) students are behind their international counterparts in STEM subjects, then the U.S. has a problem (Kuenzi, 2008). Research conducted by Ford (1992) and Bandura (1997) classified school context factors as playing a vital role in the implementation of IBI with CMSST (Vega & Brown, 2013). Behavior problems, low test scores, and failing schools need to consider the many educational benefits of IBI (Zhao, 2011). In fact, Grant (2011), reveals there is a lack of study on achievement test scores of students in traditional instruction versus those in IBI. Without this study, a general problem encountered includes teachers, curriculum coordinators, and principals who may not know how to properly implement IBI in the Christian middle schools to increase the interest and learning of CMSSS. IBI requires creativity and allows teachers to step away from the confines of the printed page, sitting in straight rows, worksheets, and listening to the teacher (Armstrong, 1994). Lower grades academic achievement rises when the standards require IBI implementation and the teacher chooses not to teach from a textbook; consequently, when a student fails the test, then the student may be labeled failure, regardless of other academic successes (Zhao, 2011).

The proposed research is empirically significant and relevant to the field of science education. Traditional education inhibits the teacher from being the instructional designer and trainer; Students feel trapped by boredom and monotony which suppresses learning for the majority (Alacapinar, 2008). The theories guiding this study include Lev Vygotsky's (1998)

Social Constructivism, John Dewey's (1948) Constructivism, and William Glasser's (2005) Choice Theory.

Purpose Statement

The purpose of this qualitative phenomenology is to explore the implementation of IBI teaching strategy for the Christian middle school science teacher (CMSST) in Central Virginia. At this stage in the research, IBI is referred to as "a teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p. 3). The theory guiding this study is Choice Theory, by William Glasser (2005). The relationship between Choice Theory and IBI is affirmed by what an Austrian neurologist and renowned Holocaust survivor, Viktor Frankl in Raizman (2013) said, "Between stimulus and response there is a space. In that space is our power to choose our response. In our responses lie our growth and our freedom" (Raizman, 2013, p. 31). Growth in the science classroom depends on the choice teachers, curriculum coordinators, and principals embrace in order to implement or not to implement IBI.

Significance of the Study

The practical significance of this study seeks to benefit Christian middle school science teacher, principals, curriculum coordinators, and society at large by describing a teaching model for all stakeholders to implement thus improving learning results for middle school students. The goal is to explore why some Christian schools are not implementing IBI teaching strategies, when the NSES (2015) require public schools to implement IBI (Thornton, 2012), and the literature depicts better learning results with IBI over traditional instruction (Vega & Brown, 2013).

The empirical significance is to identify the gap in literature by studying CMSST using a small enough sample size so as to gather enough data to adequately describe how Christian schools are or are not using IBI with the intent of describing a teaching model to encourage all CMSST, curriculum coordinators, and principals to increase the learning results of the students by implementing IBI in the Christian middle school science classroom (Peled, Kali, & Dori, 2011). This added to the research for encouraging other Christian schools at large to implement IBI teaching strategies (NSES, 1996).

The theoretical significance of this study includes using Choice Theory, also known as Reality Therapy or Control Theory, as branded by William Glasser (2005), suggesting that people can control their choices and are motivated by five basic needs when making a choice: (Glasser, 1998), (a) survival, (b) love and belonging, (c) power, (d) freedom, and (e) fun (Glasser, 2005). The teaching model extended Choice Theory to teachers, curriculum coordinators, and principals within the Christian schools.

Research Questions

The proposed research questions for this study help to explore the choice of implementation that curriculum coordinators, teachers, and principals have regarding the implementation of IBI. There are four research questions that drive this study:

RQ1: If teachers are responsible for the activity and methods choices they use to teach standards, (Shillingford & Edwards, 2008), and students typically test higher in reasoning skills as a result of learning through inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom (Thornton, 2012)?

RQ2: What are curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian

school? The relationship between Choice Theory and IBI is affirmed by what an Austrian neurologist and renowned Holocaust survivor, Viktor Frankl said, (as cited in Raizman, 2013, p. 31), "Between stimulus and response there is a space. In that space is our power to choose our response. In our responses lie our growth and our freedom."

RQ3: Research question three. What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI? Inquiry succeeds best where there is support from the principal through professional development in training teachers to teach from a problem (Peled, Kali, & Dori, 2011).

RQ4: What situations or training have influenced IBI implementation? "With an appropriate curriculum and adequate instruction, middle-school students can develop the skills of investigation and the understanding that scientific inquiry is guided by knowledge, observations, ideas, and questions" (NSES, 1996, p. 143).

Definitions

1. *Choice Theory*- This theory suggests that people can control their choices and are motivated by five basic needs when making a choice: survival, love and belonging, power, freedom, and fun (Glasser, 2005).
2. *Constructivism*- Students construct understanding from themselves (Lowery, 1997).
3. *Hands-on learning*- Providing tasks and activities to learn a concept (Morman & Shield, 2011).
4. *Inquiry*- "A multifaceted activity that involves making observations; posing questions examining books and other sources of information to see what is already known; planning investigation; reviewing what is already known in light of experimental evidence; using tools to gather describe and interpret data; proposing answers,

explanations, and predictions; and communicating the results" (Carlson, Humphrey, & Reinhardt, 2003). "Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations" (NSES, p. 23).

5. *IBI*- "A teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p. 3). "Engaging students in the cognitive processes used by scientists"
6. *Project-based learning*- Project-based learning is a dynamic approach to teaching in which students explore real-world problems and challenges (http://www.edutopia.org/project-based-learning)
7. *Reform*- Changing the teaching practices (NSES, 2015).
8. *Teacher self-efficacy*- When a teacher transitions from learning about the theories of teaching to mastering the art of "instructional effectiveness which is likely to occur several years into the teaching practice" (Onofowora, 2004, pp. 34-35).
9. *Traditional classroom*- "Teachers transmit information to students while they sit in straight rows reading, working on worksheets, or listening to the teacher" (Armstrong, 1994, p. 86).

Summary

Chapter one outlines the overview and background of IBI. The background of IBI is founded on three theories: Choice Theory by William Glasser (2005), Social Constructivism by Vygotsky (1978), and Constructivism by John Dewey (1938). The motivation for this study is to fill the empirical gap in literature and to conduct a qualitative phenomenology study in order to develop a teaching model for CMSST. There is a significant problem in Christian middle schools with the lack of implementation of IBI.

The inconsistencies among the grade levels Central Christian School North (CCSN) revealed a problem and gave inspiration to this study. The purpose and problem statements align with the research question: Why do Christian schools implement or not implement IBI? CMSST and students alike greatly benefitted from the practical, empirical, and theoretical significance as well as society at large. A qualitative phenomenology was designed to gather and analyze data to ultimately describe an IBI implementation for Christian middle school science based on the national standards (NSES, 2015) already being implemented with success.

CHAPTER TWO: LITERATURE REVIEW

Overview

The purpose of this study is to explore an IBI implementation for the CMSST to offer options in an attempt to resolve a problem that exists in the majority of today's middle school science classrooms. Teachers who are inhibited by the textbook and are not implementing IBI, or are bound to the printed material are prime candidates for professional development to consider kinesthetic learning through IBI to rekindle the hands-on, IBI, project- based learning (Vega & Brown, 2013). Unfortunately, Dresner and Starvel (2004) report that many professional development seminars or courses are achieved through textbooks instead of actual constructivist, IBI experiences, resulting in textbook driven classrooms instead of inquiry-based classrooms. For this reason, teachers may be inhibited by the textbook and be reluctant to implement the IBI model.

Chapter two presents the proposed theories that give direct connection to the concepts and theories that guide this study. The related literature is presented to establish the argument for the significance of this study to show what has already been added to the literature as well as the gap in the literature. Finally, the problem and purpose implementing IBI into the middle school science curriculum for the Christian school are examined and how this study fills a gap in the literature.

Theoretical Framework

Foundationally, IBI is based in kinesthetic learning through questioning and doing (Vega & Brown, 2013). Vega and Brown (2013) studied how the implementation of IBI has educational significance as opposed to direct instruction and the traditional classroom experience. Armstrong (1994) revealed, "For most Americans, the word classroom conjures up an image of

students sitting in neat rows of desks facing the front of the room, where a teacher either sits at a large desk correcting papers or stands near a blackboard lecturing students" (p. 86). IBI thus prepares the learning atmosphere to include problems and projects which allowed students to teach others what they have learned. Students remember 100% of what they teach (McLeod, 2007). Textbooks may inhibit teachers from being the instructional designer and trainer; Students feel trapped by boredom and monotony which suppresses learning for the majority (Alacapinar, 2008). Students that are instructed in IBI display organization and management skills with varying degrees of academic success, thus meeting student needs to self-actualize by providing increased socialization and requiring students to take ownership in learning (Krajcik, 2015). Dewey's (1938) Constructivism, and Vygotsky's (1973) Social Constructivism and Glasser's (2005) Choice Theory are three theories grounded in IBI.

Historically, Greek philosopher Socrates (469 BC-399 BC) used a method of teaching that reflects IBI (Knox, 1998) called the Socratic Method. This is a dialectic, pedagogical practice where the teacher and student engage in questioning to discover a greater truth.

> These disciplined dialogues are the pedagogical approach to teaching that encourage participants to seek deeper understanding of questioned concepts. As the supporting technique, the teacher doesn't provide students with necessary information. Instead, by analyzing and exploring given text they look for information. When appropriately applied and supported by other pedagogical techniques, teaching with the Socratic Method can increase the quality of learning, the effectiveness of students' self-improvement, techniques of critical thinking, and providing active learning techniques. (Knox. 1998, pp. 511-512)

Like the Socratic Method (Knox, 1998), IBI has become a popular concept among the science education community, and many of the articles in literature support the idea that constructivism in the classroom is superior to simply learning from a textbook alone (Fensham, Gunstone, & White, 1994; Shapiro, 1994; Tobin, 1993). Secondly, there is firsthand evidence that IBI has beneficial effects on standardized tests (Vega & Brown, 2013). Eva Reeder, a former math teacher at Mountlake Terrace High School in Washington states, "No one can become a world class chef simply by attending lectures; at some point the student chef must get into the kitchen and cook something" (Galtekin, 2005, p. 548). Therefore, the teacher is the chef and chief change agent in the reform toward IBI in the classroom.

Student motivation has roots in IBI for the majority, however, there is no choosing of projects or concepts without the printed material, standards, or libraries (Galtekin, 2005). A library has resources that can be used to explore culture and history adding brief perspectives to learning topics which helps students become more engaged and can lead to student-generated questions and search strategies. Those textbook resources provide the basis from which projects are designed and researched (Gulbahar & Tinmaz, 2006).

In this literature review, the study addressed the gap in literature through observations, document reviews, and interviews to consider curriculum coordinators, teachers, and principals', beliefs and opinions of the implementation of IBI. Teaching from a problem creates a student-centered learning atmosphere, and John Dewey (1938), who promoted a student-centered learning atmosphere, recognized that the educational process is hindered through direct instruction and the traditional classroom experience. Choosing a style of instruction based on Vygotsky's (1978) Social Constructivism is another theoretical underpinning for this study. Teachers choosing to implement IBI through Glasser's (1998) Choice Theory is the third theory

on which this study is based. Constructivism uses tools, with teacher as facilitator, to present concepts which leads to assimilation and accommodation of new information with higher reasoning skills as a result of learning through inquiry (Collin & Yound, 2013; Thornton, 2012). Since the traditional classroom is directly affecting student learning, (Vega & Brown, 2013). CMSSTs are able to choose to not be affected by traditional styles of teaching, and may choose to implement IBI as a superior style of teaching (Warner & Myers, 2008).

Dewey's (1938) Constructivism

Dewey (1938) recognized constructivism as a classroom resource which allows educational self-expression. This self-expression solidifies learning as students organize, analyze, and apply new information to everyday life (Century, Levy, & Minner, 2010). Everyday life is a key component, because without this connection, In constructivism, student autonomy to "question, investigate, use evidence to explore, explain, and predict; connect evidence to knowledge and share findings" (Warner & Myers, 2008, p. 1) is a key factor to deep learning and promotes higher order (Bloom, 1956) thinking strategies as opposed to a classroom where students sit and listen to receive information (Century, Levy, & Minner, 2010; Capps & Crawford, 2013). Memorizing information is on the lower end of the Blooms (1956) scale, but Dewey (1915), through the idea of Constructivism, realized that students must have cognitive interaction with concepts in order to learn. Taylor et al. (1994) relates that constructivist thinking includes five stages to Constructivism beginning with uncertainty or questioning, leading to negotiations, sharing control of the problem, exercising voice, and relating with personal relevance to the problem being studied. IBI emerges from a combination of such theories as Constructivism by Dewey (1915) and Social Constructivism by Vygotsky (1978), which depict how learning occurs through social interaction while exploring information to

question and apply the information in real life experiences and settings (Century, Levy, & Minner, 2010). Connecting in personal relevance to real life experience is what makes IBI a memorable, meaningful and learning experience.

> Inquiry is the quest for stable community, and for Dewey, understanding is that which allows us to functionally coordinate with another's experience as well as our own; both are thus keenly aware of the transactive and interpersonal character of the quest for knowledge. (Jackson, 2012, p. 128)

Constructivism is a theory that is taking root in future science reform noted in the National Science Education Standards (NSES), the National Research Council (NRC), (NRC 1996) and Project 2061 (NRC, 1996). Constructivism is becoming an acceptable framework for teaching reform and is included in many national science education reform recommendations as noted in *Project 2061: Science for all Americans* (Rutherford & Ahlgren, 1993). According to Lowery (1997), constructivism is a philosophy that allows students to construct understanding, thus becoming a driving force in science educational reforms (NRC, 2011).

Although constructivism is gaining acceptance, the beliefs from the community and school constituents are embedded in traditional education of straight rows, worksheets, and lecturing (Armstrong, 1994) and the constructivist classroom may meet some resistance until the beliefs among the community and school constituents change to include IBI as a valid teaching method. Studies show that constructivism improves test scores and which is why the science community has accepted the phenomena over the school community (Fensham, Gunstone, & Shapiro, 1994; Tobin, 1993; White, 1004). In fact, "the Biological Science Curriculum Study (BSCS) organization listed constructivism as one of the primary strands guiding contemporary science reform" (Haney, et al., 2003, p. 366).

Vygotsky's (1973) Social Constructivism

Vygotsky (1978) states it is because of a desire to socialize that students are motivated to learn in social environments. Students enjoy teaching each other, and can model learning processes while increasing knowledge (McLeod, 2007). The end goal of social constructivism in IBI and problem based learning is for students to create a collective product that is greater than the individual contributions (Vygotsky, 1978). The impulse for self-expression can be channeled into a learning experience as students desire to teach each other and to express original ideas, creations, feelings, and values in a social setting (Powell & Brown, 2011); However, teaching methods based on the constructivist philosophy may not be readily accepted by the community, administration, and parents if the constituents are of the belief that classrooms are to remain quiet and orderly to be effective (Haney et al., 2003). Contrarily, students desire to teach each other and to express original ideas, creations, feelings, and values in a social setting. Vygotsky relays it is because of this desire that students are motivated to learn in social environments. In the IBI classroom, students create a collective product that is recognizably greater than their individual contributions. Students enjoy teaching each other, and they can model their learning processes while they increase their knowledge (Pea, 2012). Text books guide the teacher by giving concepts and standards from which they design projects to be an "instructional designer" (Haney et al., 2003, p. 368) and trainer; a coach instead of a lecturer. In IBI classrooms, teachers trade in the role of being the director of the class, a dispenser of knowledge, and an answerer of all questions. Instead, in social constructivism, teachers serve as mentors, models, and facilitators to the students. However, they are still in charge of their classes. According to Vygotsky, teachers who facilitate IBI perfect the strategies of pondering, wondering aloud, and reflecting questions back to children (Vygotsky, 1978).

Glasser's (2005) Choice Theory

Curriculum coordinators, teachers, and principals' choice for implementation of IBI is recognized by Glasser (1998) in the theory that teachers have a right to choose a better method of teaching. William Glasser's (1998) Choice Theory, also known as Reality Therapy or Control Theory, suggests that people can better control their choices and are motivated by survival, love, belonging, power, freedom, and fun (Glasser, 2005). Sullo (2007) describes Glasser's work as "The most comprehensive, fully developed psychology of internal control" (p. 8). Furthermore, people are born with an innate desire to satisfy what they need and want. Consequently, students and teachers are looking for ways to meet academic needs within Vygotsky's (1998) concept of a social setting. Here, the interaction allows for scaffolding in which the more knowledgeable student supports the weaker student (Sullo, 2007). Teacher thoughts, attitudes, perceptions, and opinions about IBI brought about decisions, actions, interactions, and behaviors to accept or reject IBI (Lloyd, 2005; Zeeman, 2006).

> Another closely related concept is self-determination theory (SDT). Deci & Ryan, (2000) conveys SDT as a theory that conceptualizes psychological needs as essential nutrients that are required for optimal psychological growth and well-being. The needs for autonomy, competence and relatedness are thought to be universal across people and cultures and applicable throughout all aspects of a person's life. Autonomy refers to the experience of choice and volition in one's behavior and involves the ability to bring about desired outcomes and feelings of effectiveness and mastery over one's environment. Finally, relatedness reflects feeling of closeness and connection on one's everyday interactions. (Milyavskaya & Koestner, 2011, p. 390)

Benefits of IBI include students becoming intrinsically motivated, effective use of scaffolding, high student engagement, and higher academic achievement (Brooks & Young, 2011). Choice Theory in IBI would include the five basic needs of the students and teachers: survival, freedom, power, belonging, and fun (Sullo, 2007).

Survival. Survival for the constituents would include a safe, secure, nourishing environment (Irvine, 2015). Mutual trust between the student and the teacher, coupled with positive affirmation and class discussion were ways to foster a safe and secure atmosphere (Irvine, 2015). Safety equipment and rules are definitely required in any IBI science lab, therefore, satisfying the need for safety and security (Maslow, 1943).

Freedom. Freedom allows for autonomy and the basic need for autonomy aids in the ownership of one's education (Deci & Ryan, 2000). Teacher facilitating choice of activities within the classroom offered three to five activities for the students to work on (Schwartz, 2009). Freedom for the constituents would include three to five choices that are actual and not forced or restricted (Patall et al., 2010). IBI offers much freedom when students have to choose the best ways to figure out the answer to the problems in the day's lesson as there are often three to five choices that are actual and not forced or restricted. Freedom in education limits boredom, stifles negative behaviors, and abates frustration resulting in an increase in intrinsic motivation, and academic performance (Brooks & Young, 2011). All students are busy in this environment including students with Attention Deficit Hyperactivity Disorder (ADHD) (Irvine, 2015).

> I even had some kids that were ADHD and had trouble sitting, so with this style of teaching, they could get up and move about. They could change their activity. It wasn't like you had to do this for half an hour, you just had to get it done. So they selected their

> time and then I would pick up a card and say, OK, if your priority was that you were working on your story, then I would go and I would see if that was what you were doing. So it freed me up to do a lot of small group or one on one work with kids. (Irvine, 2015, p. 7)

Power. Freedom of choice coupled with competence gained through self-evaluation in progress allows students to gain autonomy translating into power (Patall et al., 2010). Patall (2010) states "support for cognitive autonomy (e.g. affording opportunities for students to evaluate work from a self-referent standard) may be most effective for promoting enduring engagement and deep-level thinking" (p. 899). Confidence, actual or perceived, results in power for the constituents and is manifested in an IBI lesson that is filled with fun activities, "elements of choice, power/competence, and self-efficacy" (Irvine, 2015, p. 7).

Belonging. Students need to feel a sense of belonging that is fostered through social interactions (Maslow, 1943). Positive affirmation, displaying student work, student self-evaluation of work, and social interaction are all key components in developing a sense of belonging. Relatedness is also important in addition to being a factor in Vygotsky's theory of learning (Louis, 2009). In the IBI classroom, belonging and fun are congruent while fun activities are welcoming and engaging, allowing the constituents to enjoy the IBI lesson.

Fun. Fun is emotion (Louis, 2009). Meeting all the needs Glasser (1998) present leaves the student with a feeling of pleasure. Therefore, learning is emotional, and fun is an integral part of learning (Sullo, 2007). As a testimony to fun, the following statement is considered: "There were no behavior issues because they were all engaged and we had a lot of fun things. We did a lot of different things, it wasn't just 'Oh, go to your card and do this'" (Irvine, 2015, p. 9).

History of IBI

Existing knowledge on IBI includes Krajcik (2010), who supports IBI as being effective in the classroom with positive impact on achievement. Alacapınar (2008) relates how IBI is important because it shows that IBI is effective because the participants planned, organized, and managed their resources and their learning with varying degrees of success (Lam, 2009). IBI is rooted in problem-based learning and can meet student needs to self-actualize by providing increased socialization and requiring students to take ownership in learning (Gardner, 2007). One case study endorsed IBI after a study about training engineering students to think independently to prepare them for the 21st century through problem- based learning and methodologies (Krajcik, 2010). This is important to the study because it is an example of how Project Based learning supports independent thinking (Savage, 2006). Implementing IBI is important to both teacher and student while another study observed teacher acceptance and student engagement in IBI as being crucial for IBI success (Wurdinger, Haar, Hugg, & Bezon, 2007).

The role of teacher facilitator in IBI is to be a guide (Alacapinar, 2008). Textbooks guide the teacher by giving standards from which the teacher chooses projects and materials to plan a lesson only to be an instructional designer and trainer; a coach instead of a lecturer. Students may feel trapped by boredom and monotony which suppress learning for the majority as seen in Kanevsky and Keighley (2003), who extend research on student boredom in the classroom. As a result of this study, an IBI implementation is described to serve as a model on how to increase student learning through the integration of IBI in the middle school classroom with the teacher's role as instructional designer and trainer. IBI may be effective because the participants planned, organized, and managed their resources and their learning with varying degrees of success (Lam,

2009). Students are independent learners while teachers are facilitators who plan, present, and guide the discovery of student learning; heretofore, Savage (2006) presents IBI as supporting independent thinking.

Consequently, this study on the implementation of IBI descibes a teaching model for Christian middle school classrooms to implement, thus filling the gap in literature. Studies show that inquiry succeeds best where there is support from the principal through professional development in training teachers to teach from a problem (Peled, Kali, & Dori, 2011). Research does not reveal evidence of the CMSST using IBI successfully in the science classroom. A phenomenology to explore if IBI is being implemented in the Christian middle school is necessary to uncover the need for IBI in the Christian middle schools. "From gleaning new, viable technology skills, to becoming proficient communicators and advanced problem solvers, students benefit from this approach to instruction" (Kjaczik, 2010, p. 34). The results of the study are significant in the understanding of IBI and how to help the Christian schools promote a more significant science education strategy to promote better learning, interested students, and leaders in society.

> Martha Leypolt, in *Learning is Change,* published in 1961 states,
>
> Combining experience, body, sight, sound, and print or involving all of these experiences in a total learning situation involves the learner as a whole person and gives him an opportunity to express his learning through some action. Such a sequence of activities would, of necessity, take place over a series of sessions, but the totality of the experience produces involvement, interest, and total response throughout all of the sessions. (Leypolt, 1961, p. 111)

Cynthia Tobias in *The Way They Learn*, published in 1993, presents issues that result in every classroom: restlessness, will not listen, distracts others, cannot follow directions, incomplete work, short attention span, will not focus, obstinate/ will not do the project the way the teacher says to. Most of these problems are able to be resolved by producing interesting hands-on projects that require the student to use reasoning without being read to or lectured. Vital to learning is being taught in the way one learns best.

Mel Levine in *A Mind at A Time*, published in 2002, conveys the fact that the school age years are spent cramming to remember facts. A better method of testing is to test subjectively giving opportunity to display understanding of the concepts as opposed to remembering facts and being required to test objectively by regurgitating factoids that mean nothing. Be creative in testing. Learn to accommodate the different learning styles in the individual students by allowing for accommodations. This may be accomplished through a lesson designed with a project and tested creatively through an oral report or another presentation format as the test grade. In *The Myth of Laziness*, published in 2003, Levine states,

> Too often gratifying academic kudos goes to clever learners who are the best test takers, and their success may boil down to the fact that they are the best rote memorizers, giving world-class regurgitations of information. Although tests play a vital role in learning and in the assessment of learning, they should not be embraced as the only ways of showing what you know and what you can do. (Levine, 2003, p. 211)

A student portfolio of all the works and accomplishments may be kept and weighted as much as a test.

Project Based Learning

Project Based learning (PBL) may be misunderstood as IBI, when in actuality, PBL is just one component of IBI. To better understand how PBL is used in IBI, consider that progress in education and technology have caused fundamental changes in people's learning styles and we urgently need to teach students at a faster pace, or guide them in learning how to learn in cooperative settings with others (Leypolt, 1988; Vygotsky, 1973). Project Based Learning (PBL) places the most emphasis on topics of everyday concern, which, through the teachers' guidance, enables students to explore and solve problems together with their peers by combining curricula, teaching methods, and assessment into one single unit (Leypolt, 1988). Teaching and curriculum goals are the key to steering the learning in the lesson as teachers use the curriculum, standards, and text to choose topics from which a hands-on experience is presented with the intent of stimulating curiosity (Leypolt, 1998). Student generated questions are formed and are also encouraged to be student answered because, "The more senses that are involved in a learning experience the greater possibility there is that real learning will take place" (Leypolt, 1988, p. 116). At times group setting has problems such as students arguing among the members of the group and trouble following through with the assignment, but overall, the success of learning increased through providing various skill and making learning more enjoyable and entertaining. Assessment is a crucial element of PBL and can be evaluated through self-analysis, checklists, go to rubric makers, or video cams with editing software that turn footage into communication.

Many leaders in education have seen how inquiry and PBL can spark student excitement. Wildwood IB World Magnet School (http://www.edutopia.org/practice/wildwood-inquiry-based-

learning-developing-student-driven-questions) allows students to be in charge of their learning by using the IBI model using questions that inspire curiosity.

> Through inquiry, Wildwood works to ignite passion, inspire relevance, and develop ownership in their students. Using student inquiries and questions as guidance, teachers develop lessons that engage and excite, teaching their students to be active thinkers rather than passive learners. (Atkins, 2015, p. 1)

Adventurous and creative teachers use all resources to engage interested students into a fun, rich, relevant, meaningful and challenging learning environment while measuring the positive results- even in a standard's based environment (Atkins, 2015). PBL, when fully engaged, may resemble chaos if the observer is expecting to see a quiet classroom with all students in perfect order quietly reading or following along as the teacher reads. Expanding horizons in PBL encouraged the following skills: Connection to the real world, community partnership, and new technology (Page & LeBeau, 2006, p. 42).

Connections to Real World Experience

Forms, brochures, museum-like exhibits, and newsletters depict the results of studying Texas history by re-planning a prairie, studying the flora and fauna, and making connection with Native American ways of life (Intro to Networked PBL, 2006, para. 2). Studying lab based science projects connects kids to the real world by allowing them to understand how levers and pullies, work, how the tree and plants produce food, and why pancakes are fluffier when lemon juice is added.

Community Partnership

Students worked for two days with mentors in business, nonprofit organizations, and government agencies to get hands on practicum in that area of work. The assessment is compiled in the form of a portfolio.

New Tech High

You won't find any teachers handing out daily assignments at New Tech High in Napa, CA. You will find long-term projects such as a written essay, developing websites, power point, or photo essays and presenting these as an oral report. More info can be seen on the website. (www.newtechhigh.org)

The following PBL planning strategies may be used for all subjects:

- Begin with a standard or goal and objective from the text
- Decide on a project that takes advantage of the pupils' special skills of the class and create a rubric
- For group projects, divide responsibilities of the project
- Assign how the responsibilities are distributed
- Plot a timeline of the progress of the project and implement a school wide block schedule to accommodate time constraints
- Decide how the project is assessed and managed
- Project ideas are as follows: create a graphic organizer, create a checklist, timelines, graphs, mind maps, concept maps posters, murals, games, job aids and a. School wide writing program, hold a summer camp, etc. the list is open ended.
- Change the learning environment: install computers, software, SMART boards

- Develop supportive relationships between student and teacher for support (Page & LeBeau, 2006, pp. 42-46).

Technology

Electronic systems stimulate visual and aural parts of the brain where light and sound can fire up different parts of the brain making technology another form of brain gym (Doppelt, & Barak (2002). Computers combine bright lights, music, pitches of tone and flashing lights which produce energy in the human body (Lee, 2004). Technology in the schools widens the learning experiences beyond the classroom walls for students and teachers alike while busy teachers and students collaborate with others through asynchronous communication such as email, online classes, resource websites with ideas for activities, instant messaging, and discussion boards. White boards particularly motivate boys and inclusion students, while SMART boards also known as whiteboards, prepare students for a digital future by transforming the classroom whiteboard into a giant touchpad by connecting to a computer and projector (Lee, 2004). Students and teachers simply touch to operate. Using a finger or pen as a mouse, it is simple to access and control any computer application, file or multimedia platform, including the internet, CD ROMs and DVDs. The work can be saved for future lessons as well as review, and this type of data recording will assure learning disabled students or absentees exact notation of any lecture upon receiving a printed copy from the teacher.

IBI in technology, has been gaining more and more favor according to Chien-I Lee (2004) of the *Journal of Computer Assisted Learning*. Incorporating IBI is a difficult job alone, almost impossible to implement thoroughly in schools without the use of new technologies (Lee, 2004). The internet is a passageway to IBI,

> "A useful platform and enabler to overcome the limits of time and space promoting social education through virtual means, broadening the scope for interaction between learners and others, and most researchers agree that using the Internet as a basic instrument is the wave of the future." (Grant & Roberts, 2005, p. 65)

IBI

Inquiry-based instruction can be defined as using the environment, content knowledge, and curiosity, along with the scientific method to question, test, and refine a hypothesis to construct understanding (Crawford, 2000; Bhattacharyya, Volk, & Lumpe, 2009; Lower, 1997; NRC, 1996).

> The standards define inquiry as "a multi-faceted activity that involves making observations, posing questions, examining books and other sources of information to see what is already known; planning investigations, reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations. Students will engage in selected aspects of inquiry as they learn the scientific way of knowing the natural world, but they also should develop the capacity to conduct complete inquiries." (NRC, 1996, p. 23)

The standards elements for IBI under consideration for guiding curriculum in this study are identified by the NRC (2011) as "characteristics of successful K-12 STEM education and included: adequate instructional time, equal access to high-quality STEM learning opportunities, school conditions and cultures that support learning, school leadership as the driver for change, parent communities, student-centered learning climate, and instructional guidance" (Pea, 2012,

p. 42). According to the National Association of Science (NAS) (NAS, 1995), the IBI process is defined by Warner & Myers (2008), in five steps which include: question, investigate; use evidence to explore, explain, predict; connect evidence to knowledge, and share findings. To further explain the IBI process, consider the following definition of Real science:

> Real science is the process of research beginning with observations that lead to inferences that can be tested, and resolved. The role of the student is active, reflective and cooperative. Students must work together at times to collect and analyze data. Students must also learn convergent thinking that is to come to a common understanding as well as insight to how others think. The teacher creates the environment for learning, sets the stage, guides, helps learners to self-evaluate, encourages, appreciates, exhibits joy in learning and in leading others (students) to learn, respects students, must love learning or learn to love to learn. The student is at the center. (Haney et al., 2003, p. 372)

Question

Questioning is the beginning of IBI. "Ask a question about objects, organisms, and events in the environment" (Carin, Bass, & Constant, 2005, p. 21) to initiate the inquiry process. Natural questions concerning the experiment at hand will emerge as students begin investigating the topic.

Investigate

As students begin the observation process, yet new questions will emerge that require research and investigation which leads to the next step stated in the Carin, Bass, and Constant (2005) visual: "Plan and conduct a simple investigation" (p. 21).

Use of evidence to explore, explain, and predict

After gathering new information regarding the experiment at hand, a comparison and review of all new found data will determine new evidence from which predictions and conclusions may be drawn (Warner & Myers, 2008). The next step according to Carin, Bass, and Constant (2005) says: "Use appropriate tools and techniques to gather and interpret data" (p. 21). Continuous repeating of the investigation and use of evidence procedures continued until the student is ready to connect, conclude, and share findings.

Connecting evidence to knowledge

After gathering data and analyzing the findings, students will look for outstanding differences in the findings to connect what is known to what is different. The connecting evidence to knowledge is the assimilation and accommodation process of learning (Warner & Myers, 2008).

Sharing findings

The connection process is accomplished through teaching others (Warner & Myers, 2008). The final stage of sharing findings is a higher order of thinking as students take what was learned and teach it to another person. Sharing findings solidifies knowledge as the students discuss the findings and conclusions (Warner & Myers, 2008).

All in all, Warner and Myers (2008) concludes that IBI is a mixture of scaffolding different learning styles and developmental levels in a process of "collaboration with others, collecting and interpreting data, organizing and developing representations of their data, and sharing their findings with others" (p. 3). This is an advantage in achieving some of the science standards in which students are able to integrate many skills at once such as science, language arts, and creative thinking (Warner & Myers, 2008).

> IBI methods align with the hands-on, experiential education format agricultural education provides. IBI requires students to actively use their hands and minds, and as a result, students are able to assemble ideas to create their own knowledge and understanding. (Warner & Myers, 2008, p. 3)

In addition, Taylor et al. (1994) defines constructivist teaching in five components including "scientific uncertainty, student negotiation, shared control, critical voice, and personal relevance" (p. 1). Another source defines IBI as when students "plan and justify their ideas, examine the ideas of other students, and reflect upon the viability of their own ideas, as well as invite students to share control of designing and managing activities, assessments, and classroom norms" (Haney et al., 2003, p. 366). When connected to everyday experiences, a deeper learning takes place through IBI (Pea, 2012). In IBI classrooms, teachers trade in the role of being the director of the class, a dispenser of knowledge, and an answerer of all questions, for preparing the learning atmosphere to include constructivist projects which present student opportunity to teach what they have learned. In social constructivism, teachers serve as mentors, models, and facilitators to the students (Haney et al., 2003). The IBI process is not just Project Based Learning (Powell & Brown, 2011), it is a method that needs to be taught to teachers and the community.

The Eisenhower project was a grant, created to introduce the concept of IBI to the community. The participants included teachers, administrators, parents/community members, and high school students. The goal was to make the community more aware of IBI programs. Using the BALE instrument (Varrella & Burry-Stock, 1997), an open-ended statement was used to collect data. The project included discussions, needs assessments, and action plans between all participants and the outcome revealed that "teaching for understanding" consisted of five belief

traits common to the participants “facilitator as guide, considering student prior knowledge, student relevance, higher order thinking, and assessment” (Haney et al., 2003, p. 368).

Teacher Beliefs

Teacher beliefs are portrayed in convictions, opinions, outlooks, and decisions on how concepts are to be presented in the class (Haney et al., 2003). Beliefs about classrooms are formed as early as preschool or kindergarten in congruence with the earliest exposure to the educational atmosphere because beliefs about education impact classroom practice (Taylor, et. al., 1994; Pajares, 1992). As teachers work at shifting toward more student-centered classrooms, the teacher-centered framework, so familiar and dominant in educational settings, is used as a lens by administrators, parents, and other teachers in ways that likely inhibit or thwart reform efforts (Taylor, Fraser, & Fisher, 1997).

Wurdinger and Bezon (2007) studied teacher acceptance and student engagement in IBI From the findings, the following may be confirmed: Attitudes form beliefs and beliefs form attitudes. From attitudes, actions are birthed which is why “beliefs become a crucial change agent in systemic school reform” (Cuban, 1990; Haney et al., 2003, p. 367). Pajares (1992) realized that beliefs are rarely altered during adulthood, which is why changing a teacher’s belief about IBI in the classroom is the only way to reform science education (Bybee, 1993; Cuban, 199; Fullan & Miles, 1992; Tobin, Tippins, & Gallard, 1994). Parjares (1992) also found that “changes in adulthood are rare” (Haney et al., 2003, p. 367). “The constructivist belief structures of teachers, administrators, parents, community members, and students” (Haney et al., 2003, p. 367) need to be altered for constructivism reform to be accepted using IBI in the classrooms.

One instrument used to measure teacher beliefs individuals hold regarding constructivism is the Beliefs About Learning Environments (BALE) (Varella & Burry-Stock’s, 1997). The

BALE instrument is a 5 point likert-scale with sub-categories weighted at 5 points each, resulting in a maximum score of 60 points. The scale is measuring the level of each participant as being constructivist by nature by responding to this open ended response statement: “My perception of the role of a teacher and his/her students in a successful learning environment is" (Haney et al., 2003, p. 369). Haney, Czerniak, and Lumpe, (2003) explain that the response could be in the form of a one page paper, learning map or web, key points, diagrams, or any other way that is meaningful to the participant (p. 369). Varella & Burry-Stock (1997) detail the five categories in the BALE to include: “teaching for understanding, instructional approach, valuing the learner as an individual, questioning habits, and extension of students’ thinking time” (Haney et al., 2003, p. 376).

Under each category are a total of 12 sub-categories composed of belief characteristics. Under the first category, the subcategories include:

> Teacher as facilitator, student preconceptions and relevance, higher order thinking skills, demonstration of understanding, and construction of student conceptual understanding Under category two, the sub-categories include: variety of instructional approaches, activity-based instructional approach, and materials and resources. The third category includes teacher-student relationship, and student autonomy valuing students’ opinions. Category four and five include questioning habits and wait-time, and elaboration of student response time. (Haney et al., 2003, p. 376)

All in all, the BALE instrument high scores for identifying successful teachers include traits such as teacher stimulating and guiding instead of lecturing, offering “real” science, mutual respect, and having the student as the center of learning while curriculum, instruction, and assessment scored lower (Haney et al., 2003).

An optional instrument, not used in this study, one which is able to be used to measure teacher beliefs is the Classroom Learning is the Environment Survey (CLES) (Taylor et al., 1994). The CLES was developed by Peter C Taylor, Barry J Fraser, and Darrell L Fisher (1997) with the intent to "enable researchers, teachers and teacher-researchers to monitor constructivist teaching approaches and to address constraints to the development of constructivist classroom climates" (Taylor et.al., 1994, p. 293).

The incorporation of constructivist and critical theory perspectives on the farming of the classroom learning environment led to the development of the Constructivist Learning Environment Survey (CLES). CLES enables researchers and teacher-researchers to monitor constructivist teaching approaches and to address key restraints to the development of constructivist classroom climates. CLES assesses either student or teacher perceptions of Personal Relevance, Uncertainty, Student Negotiation, Shared Control, and Critical Voice. The p plausibility of the CLES was established in small-scale classroom-based qualitative studies and its statistical integrity and robustness were validated in large-scale studies conducted in the USA and Australia (Taylor et al., 1997, p. 293). The CLES is used in sync with the BALE to "measure the degree to which each participant values each of the five categories" used in the BALE (Taylor et. al., 1997, p. 376).

Professional Development

Professional development (PD) is used to help teachers achieve higher results in educating and many teachers are lacking PD to effectively teach IBI (Crawford, 2000). "Some studies show that although teachers have student-centered teaching and learning beliefs, they may not be able to implement their beliefs into their classroom practice because of the inadequate practical knowledge needed in the classroom" (Savasci-Acikalin, 2009, p. 1)

Furthermore, Kim and Fortner (2007) advise that teachers are not trained in the scientific process and need to have more professional development to be trained in IBI (Powell & Brown, 2011; Bhattacharyya et al., 2009). Consequently, there is a great need for professional development so teachers are informed, confident in, and capable of implementing IBI.

Changing teaching methods is challenging and requires intervention programs. Yager and Ackay (2010) explain, "Teachers hesitate to teach science through inquiry or to use it as a new form of content because they did not learn in such ways during their preparation to become teachers" (p. 1). Programs that effectively equip teachers in the IBI process to increase teacher self- efficacy include embedded field experiences resulting in "greater understanding of the research-based science teaching practices" (McDonnough & Matkins, 2010, p. 13) as opposed to the methods courses. An example of this would include partnerships. PD using scientist-teacher partnerships are most effective in developing deeper understanding of the IBI process to include, but not limited to: investigation, experiments, hands-on lab activities, new technology, and an increase in record keeping assignments (Siverstein, Dubner, Miller, Glied, & Loike, 2009). Dresner and Worley (2006) promote teacher and scientist partnerships during the school year to enable teachers to learn while they are teaching. The cooperating scientist would be available as a reference source, guide, or visitor in the classroom, resulting in teacher leadership, and an increased knowledge of the subject area (Siverstain et al., 2009; Weisbaum & Huang, 2001).

The Kenan Fellow Program is a scientist-teacher program designed to identify and train, and keep teachers in the science, technology, engineering, and mathematics (STEM) education career, while developing IBI curricula through scientist-teacher partnerships (Moman & Schild, 2011). The Kenan Fellows Program is a summer externship located in North Carolina State Universtiy.

> The goals are to develop and retain STEM teacher leaders, advance effective 21st century teaching skills, develop relevant STEM k-12 instruction and best practice through the partnership of teachers and scientist, and last, to develop a curriculum project that is an innovative and relevant curricular resource for other STEM educators. (Moman & Schild, 2011, p. 49)

Teachers need to inquire about ways educators can promote learning among students. Professional development is one answer. Schools are offering a variety of professional development training activities to help teachers use and apply technology. The wise administrator is one who makes good use of all opportunities available. Yaron, Doppelt (2003) conveys that accommodating PBL will require blocks of time thus implementing the block schedule will greatly enhance the successfulness of the new program, therefore, PBL turned out to be one key to unlocking the door to learning.

Diverse instructional approaches such as IBI, are not widely accepted if the belief about IBI is limited. According to Haney and Lumpe (1995), professional development for principals, teachers, and curriculum coordinators greatly increased the awareness and acceptance of IBI methods. However, it is critical for the implementation that all participants in the educational process be included in the professional development experiences (Haney et al., 2003). Haney (2003) report the following:

> School improvement projects to focus on improving community awareness of, support for, and involvement in constructivist base cool science programs. If it is true that teachers and administrators adopt more positive constructive beliefs through their involvement in effective professional development opportunities, the parents, community members and students will likely benefit from these experiences as well. (p. 374)

In addition, concerning the guidelines for constructivist teaching methods, the California National Council of Teachers of mathematics guidelines had a public debate in some states regarding the implementation of IBI; heretofore, Haney (2003) report that the community also needs to be informed of the facts regarding IBI.

> It's imperative that the decision-making to citizens are not only presented with accurate information based on classroom research regarding teaching and learning, but they're invited into the schools to see these ideas in operation and become involved with these constructivist practices. Teachers and administrators can no longer afford to close the door and do as we please. (p. 374)

After all constituents are trained and have a thorough understanding and belief in the IBI process, "the beliefs of those involved in the change process can be targeted and addressed so the reform has a better chance for lasting success" (Haney et al., 2003, p. 375). In fact, *National Science Education Standards* (NRC, 1996) advocated for a philosophy entitled "Science for ALL students" to "ensure that science opportunities are afforded to all students, the inclusion of diverse instructional approaches is necessary to provide these students with abundant opportunities to learn based on the multitude of existing student learning styles" (Haney et al., 2003, p. 374).

Teacher Self-Efficacy

Self-efficacy is a term used to depict a teacher confident in his/her abilities, specifically "about their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1993, p. 118). The level of confidence a teacher has to perceive his or her self as capable to teach IBI depends on the different levels of efficacy between and within content areas (Tschannen-Moran, Hoy, and Hoy, 1998). Self-efficacy is not actual

competency, but rather a perception of competency, and teachers with a lower self-efficacy tend to lack motivation and interaction with low achieving students, whereas teachers with greater self-efficacy tend to demonstrate greater math and language achievement (Ashton & Webb, 1986; Allinder, 1995).

Science teachers who lack high levels of self-efficacy tend to have less effectiveness in the classroom (Battacharyya et. al., 2009). Increasing teacher self-efficacy through professional development will positively affect teacher student performance and the effectiveness of teachers (Powell & Brown, 2011). Teachers who participate in the PD scientist-teacher partnerships demonstrate greater knowledge of the IBI process, greater confidence in their craft, and self-efficacy in the content being taught (Morrison & Estes, 2007; Dresner & Moldenke, 2002).

Another benefit of teacher self-efficacy through PD in the scientist-teacher PD program is noted by Desner & Modenke (2002) in that students benefit by performing better in inquiry skills when teachers are confident in the IBI. Silverstein et al. (2009) noticed significant increases in student performance in achievement and tests and suggests the program leads to "A deeper conceptual understanding and increased motivation on the part of the students" (Dresner & Worley, 2000 p. 12).

School Environment

"Since the 1990's there has been concern about whether or not school environmental context factors interfere with inquiry-based teaching" (Pea, 2012, p. 37). School environment, according to Ford (1992) and Bandura (1997), includes three categories: people, policies, and provisions. A study by Pea (2012) reveals school environment does not hinder a teacher's ability to implement IBI.

Ultimately, teacher beliefs and reform are dependent upon professional development and changing teacher beliefs to include IBI ideals. Among the important factors, teachers were more inclined to implement IBI if there were instructional materials and supplies (provisions), coupled with principal support (people). With these two factors in place, NRC (2011) policymakers are given the green light for implementing IBI in the Christian middle school science standards. People, policies, and provisions are key factors in persuading teachers to emerge from isolation into the world of constructivism, but are not limited by the three factors (Church, Bland, & Church, 2010).

People

However, there is another challenge observed involving the people factor. Of the three factors, teachers and students fall into the people factor. In the study by Pea (2012), teachers and students faced a challenge with the implementation of IBI. Due to the nature of IBI, some students were challenged by the levels of organization, maturity, and responsibility it took to be successful in the IBI setting (Pea, 2012). Specifically, students were required to inquire, interact with others, follow through with tasks, record data, assess notebooks, reflect, be creative in interpreting findings, and submit work on time which requires a great level of maturity (Pea, 2012). One teacher being observed stated, "students' lack of maturity and low interest in science have made him resort to using less inquiry-based practices than he would have liked to" (Pea, 2012, p. 42). Therefore, student motivation was found to be the most important factor in teachers engaging in IBI (Pea, 2012).

Furthermore, the rest of the human factor includes all other constituents in the educational process. According to the results, "The Christian middle school science teacher (CMMST) believed that in the next school year, support from peers and lead teachers, mentor

and model teachers, principals and middle school science supervisors, and students who worked well together would likely occur" (Pea, 2012, p. 39). There is also belief that class time and after school tutoring would also be increased. Hence, student motivation was not as important if all these other people within the school were offering support.

Policies

Standards and benchmarks are considered policies, therefore, implementing IBI into the school policy, is "central to the National Science Education Standards (NRC, 1996), and the Benchmarks for Science Literacy (AAAS, 1993). The study by Pea (2012) was conducted in

> A large urban/suburban school district in the northeastern part of the US having a population of approximately 170,000 students enrolled in 240 schools with a mixture of White, Hispanic, African-American and Asian students. The participants were seventh and eighth grade science teachers in the district (Pea, 2012, p. 37).
>
> This public school district study revealed that school policies did not hinder teachers from engaging in IBI, but rather supported teachers. In addition, the study revealed that policies would most likely remain the same and "ranked team planning as the most critical item followed by policies that supported science teaching." (Pea, 2012, p. 38)

Provisions

As described by Pea (2012), an IBI classroom will have work stations, safety equipment, and many types of materials for conducting experiments which include the need for test tubes, chemicals, burners, dishes, and more. In addition to the supplies, there are also paper and pencil supplies needed for recording data, making inferences, drawing conclusions, and making solutions (p. 42). Principals are responsible for the purchase of such items and without the support of this important constituent the IBI process may be hindered. In this study the

principals received positive feedback for being supportive and "providing materials needed to be successful, and in some cases, were given too much" (Pea, 2012, p. 42). Not only were supplies readily available, this county had a high priority placed on science teaching in the standards (NRC, 2011).

In conclusion, why use IBI in the school environment? Inquiry-based learning requires students to actively use their hands and mind, and as a result, students are able to assemble ideas to create their own knowledge and understanding. Inquiry-based methods support many national and state learning standards and allow agricultural educators to contribute to school-wide educational goals (Warner & Myers, 2008, p. 3).

In addition, in a study done by Yager and Akcay (2010), the results indicated that the inquiry science skills in processing, creativity, application of science concepts, and promoting positive attitudes increased greatly, more than the students in traditional classrooms (Yager & Ackay, 2010).

Summary

All in all, the traditional classroom is directly affecting student motivation to learn, (Vega & Brown, 2013) and a possible cause of this problem may be that students are passively learning from a textbook and are not actively engaged in hands-on projects (Vega & Brown, 2013) steeped in IBI. Optional curricula using a lab based teaching strategy instead of text based strategy may be the key to re-engaging the students who are bored in the traditional classroom (Kanevsky & Keighley, 2003). If teachers are responsible for the choices they make (Shillingford & Edwards, 2008), and students typically test higher in reasoning skills as a result of learning through inquiry (Thornton, 2012), then more teachers should implement IBI. "With an appropriate curriculum and adequate instruction, middle-school students can develop the

skills of investigation and the understanding that scientific inquiry is guided by knowledge, observations, ideas, and questions" (NSES, 1996, p. 143). Teaching standards need to include IBI.

There is research to support that the NSES (2015) implements IBI in the teaching standards and are "central to the National Science Education Standards (NRC, 1996), and the Benchmarks for Science Literacy (AAAS, 1993). However, there is little research demonstrating that Christian school teachers are required to implement IBI. "Inquiry –based methods support many national and state learning standards and allow agricultural educators to contribute to school-wide educational goals" (Warner & Myers, 2008, p. 3). Inquiry succeeds best where there is support from the principal through professional development in training teachers to teach from a problem (Peled, Kali, & Dori, 2011). Gaining insight into the choice and implementation of Teachers, curriculum coordinators, and principals on middle school inquiry-based science in the Christian schools is a cause for further research to promote higher learning outcomes for all stakeholders. More evidence is needed to support the implementation of IBI in Christian middle school science classrooms. Constructivism is a theory based on John Dewey (1938) and the discovery, hands-on, experiential, collaborative, project-based, and task-based learning methods. Constructivism is supported by IBI which supports the constructivist theory (Vygotsky, 1978). Important thinkers and experts/theorists in this field of study include: John Dewey (1938), Vygotsky (1978), and Glasser (1998). Research shows that the implementation of IBI has significant academic benefits and promote student success in becoming 21st century members of society (Krajcik, 2010).

CHAPTER THREE: METHODS

Overview

The purpose of this qualitative phenomenology is to develop a teaching model for middle school science students in the Christian middle schools. This study utilized document reviews, observations, and interviews to gather information after securing permission from the IRB at Liberty University.

Design

Selecting a qualitative transcendental phenomenology design is most consistent with my research questions and procedures; thus, is most suitable for this study on Christian school implementation of IBI for Christian middle school science instruction. A transcendental phenomenology according to Moustakas (1994), is the following:

> Husserl espoused transcendental phenomenology, and it later became a guiding concept for Moustakas as well. In this approach, I set aside prejudgments regarding the phenomenon being investigated. Also, the research relies on intuition, imagination, and universal structures to obtain a picture of the experience and uses systematic methods of analysis as advanced by Moustakas (1994).

Of the five Christian schools under analysis for implementation of IBI, curriculum coordinators, teachers, and principals were interviewed with informal, topical, guided questions, documents were reviewed, and the teachers were observed for focused information on the implementation of IBI (Moustakas, 1994) to explore the essence of the "common features and structural connections that are manifest in the examples collected" (Polkinghorne, 1989, p. 57). Phenomenon is a Greek word that means "to bring to light, to place in brightness, to show itself in itself, the totality of what lies before us in the light of day" (Heidegger, 1977, pp. 74-75).

Human experience in the area of implementing IBI in the middle school science classroom is the phenomenon being brought to light and may expectantly show itself as lacking in Christian middle schools. Husserl (1931) asserts that a phenomenon "serves as the essential beginning of a science that seeks valid determinations that are open to anyone to verify" (Husserl, 1931, p 129). Verifying IBI as a higher level of learning and a superior choice for the CMSST is the phenomenon open to duplication and verification. Husserl's (1931) *epoche,* a Greek word, is a design that allows me to detach my own feelings about the phenomenon and see the issues fresh as if for the first time. However, according to Schutz (1967), without my feelings about a phenomenon, it would be impossible to relate to another's experiences in the same phenomenon. Although IBI is found to be a superior method of delivery, Husserl's (1931) *Epoche* is a design that allows me, to detach my feelings regarding support of IBI, and allows a fresh look at the phenomenon of IBI in the middle school science classrooms. One way I detach feelings in this study is due to the fact that I knew very little about IBI in the field of middle school science.

Research Questions

The research questions for this phenomenology on the implementation of IBI in the Christian middle school science curriculum include, but are not limited to the following:

RQ1: If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom?

RQ2: What are curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school?

RQ3: What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI?

RQ4: What situations or training have influenced IBI implementation?

Setting

The site for this study was located in five central Virginia Christian school systems. The host city has a population of 75,568 as of 2010 and is considered an independent city in the Commonwealth of Virginia. Located in the foothills of the Blue Ridge Mountains along the banks of the James River, the Metropolitan statistical area is 2,122 square miles (5,500 km) and is near the geographic center of Virginia. Currently, 19 high schools (public and private), ten middle schools, and several elementary schools utilizing a K–5, 6–8, 9–12 grade-level configuration are in the surrounding area. The community is culturally diverse with a population that is 3% Hispanic, 29% African American, 63% white, .2% Native American, 3% Asian, and other races1.8%" (2016, School website URL withheld to maintain institutional and participant anonymity).

The plan was to select five Christian middle schools from the Association of Christian Schools International (ACSI) in central Virginia that "purposefully inform an understanding of the research problem and central phenomenon in the study" (p. 125). ACSI was founded in 1978 with a mission statement that seeks to "Strengthen Christian schools and equip Christian educators worldwide as they prepare students academically and inspire them to become devoted followers of Jesus Christ" (ACSI website, 2015 p.1). These schools were chosen based on the

purpose of this study which was to explore an IBI science implementation for Christian middle schools. The organizations were structured the same having a principal, and three CMSST. Schools were chosen based on Christian views and locations for ease in traveling distance.

"Christian School One" (CS1)

The First Christian School (pseudonym) is located in central Virginia and has an enrollment of 1700 in grades nursery kindergarten (NK)-12. This Christian school is a member of ACSI.

"Christian School Two" (CS2)

The Second Christian School (pseudonym) is located in central Virginia and has an enrollment of 400 or less in grades nursery kindergarten (NK)-12. This Christian school is a member of ACSI.

"Christian School Three" (CS3)

The Third Christian School (pseudonym) is located in central Virginia and has an enrollment of 400 or less in grades nursery kindergarten (NK)-12. This Christian school is a member of ACSI.

"Christian School Four" (CS4)

The Fourth Christian School (pseudonym) is located in central Virginia and has an enrollment of 400 or less in grades nursery kindergarten (NK)-12. This Christian school is a member of ACSI.

"Christian School Five" CS5)

The Fifth Christian School (pseudonym) is located in central Virginia and has an enrollment of 400 or less in grades nursery kindergarten (NK)-12. This Christian school is a member of ACSI.

Participants

The participants included middle school teachers from grades six, seven, and eight in the five Christian schools in central Virginia. Moustakas (1994) recommends at least six participants for this design, and there were 10. The five middle school principals along with one curriculum coordinator were invited to participate. By relying on my own judgement to select group members, Creswell (2007) advises to use purposeful sampling and therefore, I selected five Christian middle schools from the Association of Christian Schools International (ACSI) in Central Virginia. Purposeful sampling "purposefully informed an understanding of the research problem and central phenomenon in the study" (p. 125). A smaller sampling allowed for a rich, thick description of the experience for all involved. According to Creswell (2007), "Rich, thick description allows readers to make decisions regarding transferability" (p. 209) of the study. After seeking Institutional Review Board (IRB) permission, principals of the middle school were called and asked to participate in the study followed by a formal letter stating the intent of the study.

Procedures

The qualitative phenomenology study design was most suitable for this study on Christian school implementation of IBI for Christian middle school science instruction. IRB written permission was submitted and secured before any research was allowed to take place. The curriculum coordinators, teachers, and principals were interviewed and the data recorded to explore the level of IBI implementation. Consent forms for all participants were signed and documented before entering the schools.

Observations were made in each of the middle school science classrooms using the Science Management Observation Protocol (SMOP) which consists of 25 descriptions of

classroom and teacher characteristics that must be in place to determine if IBI is being utilized according to the National Science Standards (NSS) (Sampson, 2004). Observations were made using the Science Management Observation Protocol (SMOP) tool in each of the middle school science classrooms grades six, seven, and eight, to determine if IBI is being utilized according to the National Science Standards (2015) and the SMOP (Sampson, 2004) tool. This resulted in a total of six classroom observations.

> Patton (1990) summarized the values of observation: "(1) By direct observation I am better able to understand the context in which the people live and share activities and their lives; (2) First-hand experience enables me to be open to discover and deduce what is significant; (3) I am able to directly observe activities and infer meanings not in the awareness of participants and staff; (4) Through direct observation, I can learn things that research participants and staff may not be willing to disclose; (5) I can include his or her own perceptions of what is essential in understanding the setting, its participants and staff; and (6) First-hand observation and participation enables me to gather data through direct experience and thus be able to understand and interpret the setting and participants being studied and evaluated. (Moustakas, 1994, pp. 3-4)

Interviews for the teachers, administrators, and curriculum coordinators where applicable were recorded and transcribed regarding individual decision making in the classroom (Glassar, 2005). Stake (2005) said, "Asking questions in a way that teases out subtle meanings is a gift that grows with experience and mentoring" (p. 22). There is an art to asking good questions that lead to descriptive answers. Asking open-ended questions regarding IBI described teacher beliefs about IBI that lead to implementing or not implementing IBI teaching strategies. For the

interviews, the Beliefs About Learning Environments (BALE) instrument was used to identify teacher beliefs regarding constructivism (Haney et al., 2003).

A document review at each school was used to determine if IBI concepts are woven in into the goals and objectives, lesson plans, scope and sequence, mission statements, and any other documents available for examination to gather information regarding the implementation of IBI in response to research question one. Information gathered from documents was analyzed using Moustakas' (1994) method of analysis and includes analyzing the transcriptions of the interviews to find significant statements. From the significant statements that were identified "Clusters of meaning" (Moustakas, 1994). The clusters of meaning was categorized into themes and from the themes a textural and structural description of the IBI experiences of the participants were compiled (Creswell, 2007).

The setting of this study was primarily at five Christian middle schools in the central Virginia area. The resulting teaching model is for Christian middle schools at large. The procedures for this study began with securing Institutional Review Board (IRB) approval of both Liberty University and six local Christian schools. Following IRB approval, participants for the study were contacted to collect and describe data.

The Researcher's Role

My role is to be a human instrument in this study. The qualitative researchers collect data themselves through examining documents, observing behavior, and interviewing participants. They may use a protocol-an instrument for collecting data- but I am the one who actually gathers the information. They do not tend to use or rely on questionnaires or instruments developed by other researchers (Creswell, 2007).

I am qualified to conduct this study as I have a post graduate degree as an Educational Specialist (Ed.S.) and a masters' level degree in educational leadership, with a BS degree in elementary education. I have been an educator for 20 years with much experience in witnessing what types of curriculum interest lower and middle school aged children. My relationship to the participants is simply a researcher, with no other relationship to the participants except for being the school at which I am currently employed. The sixth grade science teacher where I am currently employed has been the inspiration for this study as she has been trained in IBI and has taken the curriculum from textbook to lab based experiments. The only texts available for the class are pamphlets provided for written information about the content of each concept taught within the labs. The assumption that I bring to this study is that students exhibited increased reasoning by teachers implementing IBI (Shillingford & Edwards, 2008).

Data Collection

Data triangulation gives validity to the research. Lather (1991), in *Getting Smart*, presents four types of validation, one being multiple methods strategies for validation of data collection. Telling a story through the dialogue of participants, which unfolds over time, simultaneously corroborating evidence from multiple data collection strategies, is the goal of every qualitative study (Creswell, 2007). Achieving date triangulation through data collection methods is found in Creswell, (2007) and includes observations, document reviews, and interviews.

The first data collected was classroom observations since observations took more time. Collecting data through observation and then recording data on the SMOP tool by Victor Samson (2004) was the first step.

Second, the school documents were analyzed since the teacher was asked to provide lesson plans during observations. Another form of documentation is to examine the goals and objectives or standards which indicated if IBI is required in the plan.

Last, the interviews with teachers, principals, and curriculum coordinators took place using the BALE tool to record data, as a culmination of the time spent at each school.

Document Review

Documents serve as a data collection method in many forms including journal or diary, letters, charts, records, and photographs. Creswell (2007) lists "analyzing public documents such as official memos, records, and archival materials" (p. 130) as a collection method that was used in this study. A document review was conducted on school documents such as the goals and objectives, lesson plans, scope and sequence, mission statements, and any other archived documents available for examination, to determine whether IBI concepts are or are not being implemented. Collecting this data was accomplished at the time of the observations. The data collection for documents was coded into themes in addition to code memoing the recorded documents. Following, the information was used in textural and structural descriptions (Moustakas, 1994). The information gathered helped to answer research question three: If IBI strategies are found in the school's documents, what, if any environmental or school climate supports help to implement or hinder implementation of IBI in the Christian middle school?

Interviews

Interviews serve as a data collection method as unstructured or semi-structured according to Creswell (2007). Unstructured questions are not prearranged, but semi-structured questions are prearranged, yet remain flexible in timing of the interview and quantity of questions asked (Flick, 1998). Polkinghorne (1989) "recommends that researchers interview from five to 25

individuals who have all experienced the phenomenon" (p. 61). Teachers, principals, and curriculum coordinators (where applicable) were interviewed regarding individual decision making in the classroom. "More or less open-ended questions are brought to the interview situation in the form of an interview guide" (Flick, 1998 p. 94). Semi-structured, open-ended interview questions are useful for this qualitative study since the purpose is to gain a thorough understanding of the IBI phenomenon. Semi-structured interviewing was chosen because there was flexibility in the interview and more questions may surface during the interview process. Interviews took place before and after observations.

The Beliefs About Learning Environments (BALE) instrument was used to identify teacher beliefs about constructivism (Haney et al., 2003) in addition to the interview questions. The BALE protocol and interview sessions helped to answer research question two: What are curriculum coordinators, teachers, and principals' perceptions to implementing or not implementing IBI in a middle school science classroom in a Christian school? In addition, the interviews helped to answer research question four: What context, situation, or professional training has influenced or not influenced experience with IBI? The BALE instrument uncovered principal and teacher beliefs in the following areas: "Teaching for understanding construct, instructional approach, valuing the leaner as an individual, using effective questioning habits, and extending students thinking" (Haney et al., 2003, p. 371).

The interviews for the teachers, curriculum coordinators, and principals took place after school, depending on teacher availability, at a time convenient for the constituents. The interviews were held at the school in a quiet conference room or classroom where there are no interruptions. An interview protocol was used to take notes during the interview. Other

recording devices included an audio recording device such as the Dragon app. Questions and interviews for the curriculum coordinators, teachers, and principals' are as follows:

- What has been or has not been your role in implementing IBI?
- What has happened since you have been or have not been implemented in IBI?
- What has been or has not been the impact on your classroom since you have or have not implemented IBI?
- What larger ramification, if any, exists from implementing or not implanting IBI?
- To whom should we talk to find out more about implementing IBI in your classroom? (Creswell, 2007, p. 136).
- Is there anything else you'd like to mention about IBI?

The purpose of these interview questions is to gain an understanding of the essence of the experiences that reveal beliefs and choices teachers make when planning a lesson, and to find themes that indicate why teachers implement or do not implement IBI. The interviews for the teachers, principals, and CC was the same since these are generalized questions for all constituents. The interviews answered research question one: How is IBI being implemented, if at all, in the Christian middle school science classroom? Research question two: What are curriculum coordinators, teachers, and principals' perceptions to implementing or not implementing IBI in a middle school science classroom in a Christian school? Research question three: If IBI strategies are found in the school's documents, then what environmental or school climate supports help to implement or hinder implementation of IBI in the Christian middle school? Research question four: What context, situation, or professional training has influenced or not influenced experience with IBI?

Observations

Observations serve as a data collection method in the form of an observer or as a participant and/or a combination of both (Creswell, 2007). Observing in a setting is a special skill that requires addressing issues such as the potential deception of the people being interviewed, impression management, and the potential marginality for me in a strange setting (Hammersley & Atkinson, 1995). A data collection protocol, or document of official rules, is typically used to record data such as portraits of the informant, physical setting, particular events and activities, and your own reactions (Bogdan & Biklen, 1992). Observations in the classroom are useful for this qualitative study and were conducted in each of the three middle school science classrooms to determine how and if IBI is being utilized according to the National Science Standards (2015) using the SMOP (2004) in conjunction with an observation protocol designed by Creswell (Creswell, 2007). The observations took place during the science class of 45 minutes. The length of the observation was determined by the length of time it takes to completely gather the data on the SMOP tool. The observation using the SMOP tool was recorded using an audio device to record along with a compilation of field notes. The information gathered helped to answer research question one: How is IBI being implemented, if at all, in the Christian middle school science classroom? In addition, observations helped to answer research question three: If IBI strategies are found in the school's documents, then what type of environmental or school climate supports help to implement or hinder implementation of IBI in the Christian middle school?

Permission for using SMOP was secured before data collection. The observation protocol, SMOP, was designed by Victor Sampson (2004), who gave permission to use the tool. Field notes about the activities summarized in chronological fashion took followed by

descriptive and reflective notes about the process with reflections and conclusions regarding the activities for later identifying themes (Creswell, 2007).

Scheduling the observations with the teachers were accomplished through the principals of the schools and me, being the main observer and not a participant. Each of the observations lasted one hour, or one class period and was repeated several times or until the all the data had been sufficiently collected to answer research question one: How is IBI being implemented, if at all, in the Christian middle school science classroom? The information on the SMOP protocol assessed five different management issues that are crucial for the IBI classroom including, "classroom characteristics and routines, time and transitions, collaboration among students, safety, and care and use of materials" (Sampson, 2004, p. 30).

Data Analysis

The data analysis used in this study was Moustakas' (1994) transcendental phenomenological reductionism, which is a process of finding patterns and themes from the statements in the interviews, the classroom observations, and the school documents. Transcendental means "in which everything is perceived freshly, as if for the first time" (Moustakas, 1994, p. 34). The steps of data analysis include grouping all experiences relevant to the phenomenon, clustering the experiences, bracketing out any themes unnecessary, labeling the horizon common themes, using the transcriptions to construct textural and structural descriptions of the essence of the experiences of all participants, and finally develop a "composite description of the meanings and essences of the experience, representing the group as a whole" (Moustakas, 1990, p. 121).

Horizontalization is a technique accomplished through "treating all initial statements as having equal value and then later deleting overlapping or repeating statements leaving just the

horizons" in IBI, (Moustakas, 1994, pp. 95-97). Moustakas' (1994) horizontalization, was used to highlight significant statements, sentences, and quotes from the interview questions, which describe the nature and meaning of the experiences with the IBI phenomenon. Next, clusters of meaning (Creswell, 2007) from the significant highlighted statements was identified and be divided into themes. Coding according to Creswell (2007), is organizing or sorting data into codes, and was helpful in recognizing the themes. These significant statements were then be written up in a textural description describing what the participants experienced. Textural description, used by Moustakas (1994), is a description of the statements and themes regarding the lived experiences of the participants. These significant statements were also be used to write about how the setting, called structural description, may have influenced the participants in the shared experiences of IBI (Creswell, 2007, p. 61).

In conclusion, Creswell (2007) describes the final stage of analysis as writing "a composite description that presents the 'essence' of the phenomenon" (p. 62) in one to two long paragraphs that leave the reader with a deeper understanding of the experience. Polkinghorne (1989), says, "The reader should come aware from the phenomenology with the feeling, 'I understand better what it is like for someone to experience that'" (p. 46). The final composite description, "the common experiences of the participants" (Creswell, 2007, p. 62), is written from the textural and structural descriptions, describing what the participants had in common. In summary, the steps of data analysis include grouping all experiences relevant to the phenomenon, clustering the experiences, labeling the horizons with common theme, using the transcriptions to construct textural and-structural descriptions of the essence of the experiences of all participants, and finally develop a "composite description of the meanings.

Trustworthiness

Triangulation of data is important for proving trustworthiness or validity (Creswell, 2007, p. 202) of data collected. According to Stake (2005), "It means being redundant and skeptical in seeing, hearing, coding, analyzing, and writing" (p. 77). First, personal memory was be an important storage for writing the final report and this is accomplished by keeping a good log, including names, telephone numbers, addresses, and dates and times (Stake, 2005). Second, all major data records was routinely duplicated and stored in more than one file. Third, all electronic files were stored under a special password. Last, more than one form of data collection was used in this study.

Member Checks

Members of the study, in particular, the interviewees, were given the data "so that they can judge the accuracy and credibility of the account" (Creswell, 2007, p. 208). This is the most critical technique for establishing credibility (Lincoln & Guba, 1985).

Peer Review

The peer debriefer (Lincoln & Guba, 1988), is a person who could ask the hard questions and play devil's advocate to keep me honest. The committee members would be the ideal debriefer for peer review to establish dependability throughout the study. This reviewer may be a peer, and both the peer and I keep written accounts of the sessions, called peer debriefing sessions (Lincoln & Guba, 1985).

Triangulation

Providing multiple sources and methods of data collection such as interviews, observations, and documentation were give the study validity and transferability to be duplicated elsewhere (Lincoln & Guba, 1985; Patton, 1990).

Transferability

This study can be easily duplicated and transferred to any school within the confines of a strong theoretical framework. This thick descriptive data is one way to allow others to duplicate this study in elsewhere (Lincoln & Guba, 1985)

Credibility

Credibility and dependability was established through member checking. After researcher gathers the data and takes it back to the participants so they can reflect on the accuracy of the documents such as the rough drafts and provide editing suggestions in the language choice. This is considered "the most critical technique for establishing credibility" (Creswell, 2013, p. 314). Member checking after the interviews secured credibility (Stake, 2005) while having an expert/peer review of the questions on the questionnaire confirmed credibility. Prolonged engagement, triangulation of data, peer debriefing, and member checks ensured credibility.

Dependability and Confirmability

Dependability was increased by the use of journals to improve memory with data. Member checking increased dependability, in addition, all electronic data from the main researcher was password protected (Stake, 2005). The data was coded into categories that indicate the usage and opinions of IBI. The coded themes became patterns. An audit trail of keeping accurate records, expert review of data and questions increased the confirmability of this study.

Ethical Considerations

Confidentiality is an ethical consideration in which all participants must remain anonymous and pseudonyms or numbers must be assigned to protect anonymity. The information was kept in a password protected word document. I presented general information

about the study and not specific information also informing the participants that there is no monetary reward for participating. Regarding confidentiality, all participants must remain anonymous and pseudonyms or numbers was assigned to protect anonymity. All participants was made aware they are participating in a study.

Summary

In summary, the purpose of this qualitative phenomenology is to explore a teaching model for middle school science students in the Christian middle schools. This study utilized interviews, observations, and documents. This qualitative phenomenology is most suitable for this study on Christian school implementation of IBI for Christian middle school science instruction. The research question guiding this study was, "How is IBI being implemented, if at all, in science middle school classrooms in Christian Schools?" Participants were selected using selective sampling choosing five schools in central Virginia, including six teachers, two to four principals, and possibly two curriculum coordinators. The data collection included interviews, observations, and documents. Data analysis included reductionism, horizontalization with textural description, and composite description to find commonalities and overlapping statements (Moustakas, 1994). Trustworthiness was established through member checking, *epoche* bracketing, and all data was password protected electronically (Creswell, 2007). Ethical considerations were addressed through protection of data, using pseudonyms, and informing participants of confidentiality.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this qualitative phenomenology was to explore the implementation of IBI teaching strategy for the Christian middle school science teacher (CMSST) in Central Virginia. At this stage in the research, IBI was referred to as "a teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p.3). The theory guiding this study is Choice Theory, by William Glasser (2005). The relationship between Choice Theory and IBI is affirmed by what an Austrian neurologist and renowned Holocaust survivor, Viktor Frankl (as cited in Raizman, 2013, p. 31) said, "Between stimulus and response there is a space. In that space is our power to choose our response. In our responses lie our growth and our freedom". Growth in the science classroom may depend on the choice teachers, curriculum coordinators, and principals embrace in order to implement or not to implement IBI.

Moustakas' (1994) transcendental phenomenological reductionism, is a process of finding patterns and themes from the statements in the interviews, the classroom observations, and the school documents. The steps of data analysis used in this study include grouping all experiences relevant to the phenomenon, clustering the experiences, bracketing out any themes unnecessary, labeling the horizon of common themes, using the transcriptions to construct textural and-structural descriptions of the essence of the experiences of all participants, and finally develop a "composite description of the meanings and essences of the experience, representing the group as a whole" (Moustakas, 1990, p. 121).

The research questions for this phenomenology on the implementation of IBI in the Christian middle school science curriculum guided this study.

1. If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom?
2. What are curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school?
3. What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI?
4. What situations or training have influenced IBI implementation?

Personal Experience with Phenomenon

By setting aside bias and personal opinion from the phenomenon, Moustakas (1994) admonishes the researcher to focus on just the participants and what they believe to be true regarding the phenomenon. My experience with IBI began with my master's thesis entitled *Project Based Prodigies vs. Textbook Boredom.*

A colleague of mine at the school where I currently teach was the inspiration for this study. Not only did Beth attend grade school where IBI was taught, she was attended many classes that are offered during professional development days in the schools she was employed in. Beth in CS1 introduced the sixth grade science curriculum to IBI resulting in converting to IBI from the traditional textbook learning over the course of one year. The transition required a whole new lab based curriculum with supplies, including instruction, time, and money invested. In my observations students it is apparent that they are highly motivated, no one complains that science

is boring, and all areas of the Terra Nova test results reflect maximum student learning. My curiosity was piqued; hence, this study.

Participant Summary

Participants were chosen based upon two factors: Christian school status and ACSI membership. Patton (2001) describes criterion sampling which involves selecting participants that meet some predetermined criterion of importance. The initial contact was an email sent to the school principals. Out of fifteen emails, only five responded favorably. Of the five, only four teachers were available to participate, yet all five principals and two curriculum coordinators were able to interview. Two of the principals served a dual role of principal and curriculum coordinator. At Christian School One (CS1), all three teachers participated while CS2 had one teacher and the principal participate. CS3, CS4, and CS5 had principals that were willing to participate, however, the teachers that were either sick, on maternity leave, or were new and under stress, hence, the principal did not want to ask them to add this study to the list of things to do.

After the participants replied to the initial email responding to the Participant Recruitment Letter (Appendix B), dates and times for the interviews and/or classroom observations were set up for

Participants

Christian School One (CS1)

Annie

Annie is the Curriculum Coordinator for CS1. The highest degree earned is an Educational Specialist (EdS). She had some online classes in addition to some private and some secular classes on campus. Of the 12 years in education, seven years have been in the classroom

and five have been in administration. Of the 12 years in teaching, one year was in the public schools while nine were in private education. Two years were spent in a fore profit situation. Annie is a very precise and detailed person who takes her work very seriously. She has had little to no training in IBI.

Jack

Jack is the Middle School Principal for CS1. The highest degree earned is a Masters in Education. He attended a private school on campus in addition to online education. Of the 22 years in education, three years have been in the classroom, 10 years were spent as the Athletic Director, and 9 years in administration. All 22 years have been in private schools. Jack is a very relational person with a passion for the students, teachers, and parents. He has had little to no training in IBI.

Beth

Beth solely teaches sixth grade science for CS1. The highest degree earned is a Masters in Education. She attended a public university on campus. She has been teaching for 24 years. Six of the 24 years have been in the public schools and 18 years have been spent in the private schools. Beth is an inspiration to her students and colleagues as she prepares inquiry based lessons each and every day. She has had extensive training in IBI.

Kathy

Kathy solely teaches the seventh grade science for CS1. The highest degree earned is a Bachelors in Education. She attended a private university on campus. She has been teaching for 29 years in a private school. Kathy has a jolly personality and is dearly loved by her colleagues and students. Kathy has a very casual, comfortable, yet professional demeanor with her colleagues and students. She has had some training in IBI.

Mandy

Mandy solely teaches eighth grade science for CS1. The highest degree earned is a Bachelor's Degree. She attended a public university on campus. She has been teaching for 13 years. Of the 13 years, four years were in public education and nine years have been in the private schools. Mandy has a mild demeanor and relates well to her colleagues and students. She has had some training in IBI.

Christian School Two (CS2)

Brenda

Brenda serves as the principal and curriculum coordinator for CS2. The highest degree earned is a Bachelor's Degree. She attended a private university on campus. She has been in private education for 30 years. Brenda is mild mannered and very professional. She has had little to no training in IBI.

Laura

Laura solely teaches sixth grade science for CS2. The highest degree earned is a Bachelor's Degree. She attended a private university on campus. Brenda has been teaching for 8 years in a private school. Laura likes to have fun in the classroom, and has a casual demeanor with her students. She has had little to no training in IBI.

Christian School Three (CS3)

Joe

Joe is the principal for CS3. The highest degree earned is a Bachelor's Degree. He attended a private university on campus. Joe has been working for 28 years in private education. Some of those years have been teaching and some have been in administration. Joe is very organized, scheduled, and prompt. He has had little to no training in IBI.

Christian School Four (CS4)

Mary

Mary is the headmistress for CS4. The highest degree earned is a Master's Degree. She attended a public university both online and on campus. Mary has been working for 29 years in private education. Of those 29 years, 14 have been in public school and 15 of those years have been in private school. Some of those years have been in teaching, some have been in administration, and currently she is serving as administrator as well as a science teacher in high school. Mary takes her work seriously and obviously has a heart for private education. She has had little to no training in IBI.

Christian School Five (CS5)

Lana

Lana is the principal for CS5. The highest degree earned is a Master's Degree. She attended a private university on campus for all of her coursework. Lana has been working for 32 years in private education. Of those 32 years, 10 have been in the classroom and 22 of those years have been in administration. Lana is very involved with the students as an administrator and seems to love her job as well as the students. She has had little to no training in IBI.

Table 1

Participant Interview Profiles

Name	Gender	Degree	Education	Field work	IBI training
Annie CS1	F	EdS	Public/Private Res/Online	7 C/ 5 Adm	N
Jack CS1	M	MA/Ed	Private/Res/Online	13 C/9 Adm	N
Beth CS1	F	MA/Ed	Private/Res/Online	24 C	Y
Kathy CS1	F	MA/Ed	Public/Private/Online	29 C	Y

Mandy CS1	F	BS	Private/Res	13 C	Y
Brenda CS2	F	EdS	Private/Res	30	N
Laura CS2	F	BS	Private/Res	8 C	N
Joe CS3	M	BA	Private/Res	28	N
Mary CS4	F	MA	Public/Res/online	29	N
Lana CS5	F	MA	Private/Res	10 C/22 Adm	N

School Documents

School documents for this study were requested from teachers and administrators for the purpose of identifying IBI in the teacher plans along with the goals and objectives. Three sets of lesson plans were submitted from CS4 only while goals and objectives were submitted for CS1, CS2, CS3, and CS4, but CS5 did not submit any documents at all.

Significant Statements and Themes

Each set of standards, taken from the goals and objectives from four of the five schools were examined for IBI word indicators which were the verb or objective in each goal. Words such as inquiry, measurement, experiment, formulate, investigate, test, modify, hypothesize, discover, create curiosity, scientific method, data, labs, and explore are founded in IBI. Objectives indicating traditional learning environments are: classify, identify, compare and contrast, differentiate, find, list, explain, arrange, match, label, develop, illustrate, apply, define, distinguish, know, and relate. The graph in Table 2 displays the word indicators that are prominent in all goals and objectives submitted.

After collecting the goals, objectives, and lesson plans from the five schools, all objectives from each document were printed out, the objectives were underlined, then grouped

together into like kinds. The main thoughts were the themes that were identified. After adding the objectives to the table, the themes were organized so the upper half of Table 2 represent the objectives that promote a high level of IBI while the objectives below are common and promote a moderate to no level of IBI. To the right of the objectives is a number which represents how many times that objective is used in the standards as a whole. In conclusion, school document data showed there were 72 IBI objectives and 183 general objectives representative of four of the five participating schools.

Table 2

School Documents

Objectives that locate IBI	Times used
Classify	18
Investigate	14
Conduct	9
Discover	6
Project	1
Hypothesize	1
scientific method	2
Data	2
Constructs	2
analyze and compile	2
Labs	1
create	1
Measure	1

Predict	1
Explore	3
Plan	1

Objectives that are not specifically IBI	Times used
Identify	29
Describe	15
Understand	14
Relate	12
Find	6
Distinguish	6
Demonstrate	5
Calculate	3
Define	3
Apply	2
Example	1
Name	1
Generate	1
Characterize	1
Correlate	1
Infer	1
locate	1
Incorporate	1

Propose	1
View	1
Utilize	1

Interviews

Interviews were conducted on four teachers, five administrators, as well as one curriculum coordinator during a time that best suited each participant in a private conference room at each school. All interviews were recorded using *Dragon,* a voice to text app downloaded to my cell phone. The recorded dictation was emailed, immediately following the interview from my cell phone directly to my email address, then copied and pasted to a Word document which was password protected. After the interviews were complete, each document was edited for accuracy and then emailed to each participant for member checking. The members were either satisfied or unsatisfied. A couple of the members had corrections to the interview answers, and emailed those changes back to me.

Significant Statements and Themes

According to Moustakas (1994), horizontalization, a method described as finding common themes among the participants and the experiences within the phenomenon, were conducted. When all interviews were reviewed and corrected for accuracy, each interview was analyzed for statements and key words that displayed codes of common themes in random order. Six themes were identified from the data:

- Relationship
- Textbooks

- Benefits of IBI
- IBI awareness
- Teacher choice
- Hindrances

Relationship was the first theme to emerge. Annie, Laura, Joe, and Mary convey that relationship is crucial for students feeling comfortable to ask questions about the objectives which in turn creates curiosity to prepare the mind for the IBI classroom. Although Mandy is not fully implementing IBI, she believes the way to merge into IBI is through grooming student curiosity in the concepts. Mandy, Kathy, Brenda believe teachers need professional development and training to effectively implement IBI. In the classroom, Annie, Beth, Mandy, Joe, Mary, Lana all believe that trust and respect are necessary for both teacher and student to display in order for questions and answers to flow freely in a safe environment. Autonomous students use questions to drive instruction according to Annie and Beth. Lana is alone in her belief that a student having a voice in the classroom is equivalent to student engagement. Beth, Brenda, Joe, and Mary also communicated that the teacher asking essential questions is a necessity in IBI. Relationship is essential for students to feel comfortable to ask questions.

Textbooks were identified as another theme, and are considered to be only a resource per Beth, Annie, Mandy, Joe, Jack, Kathy, while Mandy, Kathy, Mary believe textbook resources are best for researching topics. On the other hand, textbooks are believed to be used for direct instruction and structure in the classrooms according to Annie, Mandy, Joe, and Mary, and Brenda believes IBI is limited without these resources. Textbooks are neither a negative nor a positive indicator of IBI.

Benefits of IBI include the development of critical thinking in keeping with Lana, Annie, Jack, Beth, Mandy, Brenda, Joe. Kathy believes longer retention of concepts and life skills are built from using IBI, while Beth understands that higher level thinking is ignited with the implementation of IBI. Independent thinking is a by-product of IBI in keeping with Mandy and Kathy, but Beth can verify students have improved scores while Kathy, Brenda, and Mary encountered deeper understanding of the concepts as benefits of IBI. Contrarily, Mary has witnessed real world connections are difficult to obtain in IBI, while Kathy, Brenda, Annie are convinced IBI does in fact allow students to connect to the real world. Relationships are built through the use of IBI in proportion with Kathy and Brenda. Discovery is the essence of IBI and Jack, Beth, and Kathy can testify. Annie reported students as being more engaged and learning more while participating in the IBI classroom, in addition to meeting the standards. Beth has witnessed students developing a love for science since implementing IBI in the classroom. Joe deems that students have more control while learning through IBI. One technique to develop higher level thinking is wait time. Waiting for students to answer questions and probing to think deeper has the potential to make a student feel embarrassed, yet it may also prompt deeper answers from the student, thus promoting higher level thinking according to Annie, Mandy, Kathy, Mary, and Jack. Mary has witnessed that age and personality greatly impact the quality of questions and answers.

IBI awareness seems to be prominent in all of the five schools, but prevalent in only one school. Brenda, Laura, and Lana fully admit being ignorant of the true meaning of IBI, and Mandy and Kathy say hands-on learning is better. Annie, Joe, and Kathy, Beth, Mandy, and Brenda concur that IBI implementation is costly and the budget restraints hinder the process, whereas Mary believes there are no hindrances to using IBI. Brenda and Kathy agree that IBI is

labor intensive while Annie, Jack, and Mandy are dissuaded by the time constraints associated with IBI. Brenda reports that IBI is positive for all constituents, but professional development is mandatory to fully implement the program according to Annie, Jack, Beth, Mandy, Kathy, and Brenda. Beth has had the most training in IBI and states lectures are not needed in the IBI setting**.** No prior knowledge is necessary according to Kathy, yet Mary, Brenda, and Lana, believe it necessary to use KWL to determine prior knowledge when teaching in any classroom, including the IBI classroom. However, Annie and Jack collectively believe IBI is in essence the scientific method, while Brenda is persuaded that open-ended questions are the essence of IBI. Beth says IBI differentiates learning to individuals and Laura concluded that if scores are higher, then a teacher should use IBI. All methods considered, Lana communicates one should use a variety of instruction, and IBI motivates students to learn according to Annie, Beth, Mandy, and Kathy. Annie, Mandy, Kathy, Mary, and Jack are aware that given time for deeper answers may present anxiety in some students, thus age and personality may affect the quality of IBI for the teacher. IBI awareness was identified as a valuable theme. Without awareness, teachers may not choose IBI.

Teacher choice is another theme that was identified. Beth reports CS1 teachers do not implement IBI in the elementary classes which has a significant impact on the benefits of IBI as described above believing that student retention and thinking skills are not as prevalent upon entering middle school when IBI has not been implemented in elementary grades. Joe, a principal, chooses to allow teachers the choice in curriculum and is waiting for teachers to bring the program to administration before fully implementing the IBI model at CS3. Mandy is an advocate of IBI and is favorable to the small group aspect of IBI, while Kathy and Beth choose to start small and build progressively into IBI. The teacher is simply the classroom guide

according to Annie, Lana, Jack, Beth, Mandy, Kathy, and Mary, yet Mandy concurs that IBI is not compatible with life science and tends to lean toward projects and textbook implementation. Joe observes that teachers in CS3 have only slightly implemented IBI. Jack, Brenda, Laura, Joe, Lana, and Mary agree that whether a teacher chooses PBL or IBI, the main goal is to meet student needs. Annie, Jack, Mandy, and Kathy agree that IBI can be integrated through the use of IBI. Mary, at CS4, concurs that the teacher is the leader in the classroom and will choose what is best for the needs of the students. Annie, Joe, Kathy, and Mary IBI and PBL are not the same. In the opinion of two administrators, Jack and Lana agree IBI is avoided due to hindrances, since IBI requires a variety of instruction. Mary says that IBI needs some direct instruction by the teacher, and Joe relates IBI is mostly questions while PBL is mostly activities. Predominantly, teachers may be reluctant to choose IBI since the hindrances may make IBI seem insurmountable and out of reach.

A final theme is hindrances. Teachers and administrators are hindered from implementing IBI for several reasons. Beth, Many, and Brenda believe that IBI is costly and the school budget may not allow for full implementation of an IBI classroom. Brenda and Kathy agree that IBI is labor intensive, and Annie, Jack, and Mandy understand that IBI requires hours of planning and can be time consuming. Another hindrance is due to the level of professional development that is needed. Three teachers and three administrators agree that professional development, if not readily available, may present a deterrence to IBI, leading Mandy and Kathy to infer that hands-on science may serve the purpose just as well as IBI. The major hindrance is simply the fact that many do not truly understand what IBI entails. Brenda, Laura, and Lana did not understand what IBI was before this study. Hindrances may be valid, but are definitely viable.

Table 3

Interviews

Themes and Statements	Participant response
Relationship	
Students questions make curious	Annie, **Laura**, Joe, Mary
Trust and respect are necessary	Annie, **Beth**, **Mandy**, Joe, Mary, **Lana**
Autonomy, student questions drive instruction	Annie, **Beth**
Voice equals engagement	Lana
Teacher questions necessary	**Beth**, Brenda, Joe, Mary
Textbook	
Resource only	**Beth**, Annie, **Mandy**, Joe, Jack, **Kathy**
Used for research	**Mandy, Kathy**, Mary
At times used for direct instruction and structure	Annie, **Mandy**, Joe, Mary
Benefits of IBI	
Critical thinking is developed	Lana, Annie, Jack, **Beth, Mandy,** Brenda, Joe
Life skills are built from using IBI	**Kathy**
Real world connections difficult	Mary
Connects to real world	**Kathy**, Brenda, Annie
Builds relationships	**Kathy,** Brenda
Improved scores	**Beth**
Retain info longer	**Kathy**
Independent thinker	**Mandy, Kathy**

Deeper understanding	Jack, , Brenda, **Mary, Kathy**
Higher level thinking	**Beth**
Discover	Jack, **Beth, Kathy**
Develops love for science	**Beth**
Doing = learning	Annie
More engaged	Annie
Gives student control	Joe
IBI meets the standards	Annie
IBI Awareness	
No hindrances to using IBI	**Mary**
Seems to be positive for all	Brenda
No lectures	**Beth**
Limited without resources	Brenda
No prior knowledge is necessary	**Kathy**
KWL to determine pre-knowledge	Mary, Brenda, Lana
Scientific method	Annie, Jack
IBI and PBL not the same	Annie, Joe, **Kathy**, Mary
IBI is avoided	Jack
IBI-questions/PBL-activities	Joe
IBI and PBL are the same	**Mandy**
Variety of instruction needed	Lana
Needs some direct instruction	Mary
Motivates students to learn	Annie, Beth, **Mandy, Kathy,**

IBI is open-ended questions	Brenda
Differentiates	**Beth**
If scores are higher, use IBI	**Laura**
Higher Level Thinking	**Beth**
Wait = deeper answers, yet waiting may embarrass the kids.	Annie, **Mandy, Kathy,** Mary, Jack
Age and personality affect Q/A	Mary
Teacher choice	
Elementary not using	**Beth**
Waiting on teacher implementing	Joe
Small groups are advantageous	Mandy
Progressive: Start small and build	**Kathy, Beth**
Guide	Annie, Lana, Jack, **Beth, Mandy**, **Kathy**, Mary
IBI not compatible with life science	**Mandy**
Used slightly	Joe
Not using IBI, but if we do, merge into IBI with student curiosity	**Mandy**
Just meet student needs: use either PBL or IBI	Jack, Brenda, **Laura,** Joe, Lana, Mary
Integrate IBI with other curriculum	Annie, Jack, **Mandy, Kathy**
Leader in the classroom	Mary
Hindrances	
Costly, budget restraints	**Beth, Mandy,** Brenda

Labor intensive for all	Brenda, **Kathy**
Time consuming	Annie, Jack, **Mandy**
Professional development needed	Annie, Jack, **Beth, Mandy, Kathy,** Brenda
Hands-on is better	**Mandy, Kathy**
Not sure what it is	Brenda, **Laura,** Lana
Hours of planning	Jack
Teachers:	**Beth, Mandy, Kathy, Laura**
Administrators:	Annie, Jack, Brenda, Joe, Mary, Lana

Observations

Classroom observations were scheduled on a day that best suited each teacher as well as the SMOP tool (Sampson, 2004). If an in-class assessment was in the lesson plan, it was determined limited data would be observed, so appointments were made based on teaching times. Securing teachers was an unexpected challenge and only four teachers were available to participate thus representing two of the five schools.

Unfortunately, teachers were not as available as first anticipated. Originally, there were two participating schools. Since 10 participants were required for a phenomenology study (Moustakas, 1994), IRB permission was requested and granted to include three additional schools in order to find more teachers. After emailing the principals, the inability of teachers to participate was due to three main issues: pregnancy leave, stress due to illness, and/or the teacher was new and could only focus on classroom teaching without the additional duty of participating in a study. With principal permission, two teachers from CS2 received an email invitation to the study and they both politely declined due to personal reasons. The other

principals from CS3, CS4, and CS5 simply answered for the teachers and did not encourage personal email invites to participate.

The four participants were observed allowed one to three visits or as many as necessary to gather data. Each observation lasted one full class period of 50 minutes with the exception of two additional observations for the seventh and eighth grade teachers in CS1. See Table 4 for a summary of observation details.

Significant Statements and Themes

On the SMOP scale (Sampson, 2004), zero and one are defined as "not observed". Two, three, four, and five are defined as "very descriptive". Each point in the tool may or may not have been observed, so the rich description is detailed below SMOP (Sampson, 2004). Observations were complete within one visit for Beth and Laura, and two visits were needed for Kathy and Mandy. Observations continued until all aspects of the SMOP tool were documented.

Beth

Beth, a middle school science teacher at CS1, had a strong sense of routine during the entire class. Clear expectations with instructions were verbally given before the activity and were written on a 3x5 card which was placed on each desk. This was an inquiry activity of testing materials and compounds and recording data. Transitions between centers were smooth. The amount of time at each station was timed appropriately so all students were engaged for the duration of the class. Students worked in groups of two or three and talked about the findings at each lab as they recorded data. Safety goggles were not needed, but were available in the closet. All materials for each lab were set out before class.

Kathy

Kathy, a middle school science teacher at CS1, had a strong sense of routine during the entire class. Clear expectations and instructions were given before the activity and were written on the handout. This was a hands-on observation activity. Transitions between centers were smooth. Students worked in groups of two, or if they preferred, they could work independently. Each student met with the teacher when they finished writing up their data. Safety goggles were not needed, but were available in the closet. Materials for the activity were ready and available for easy access.

Mandy

Mandy, a middle school science teacher at CS1, had a casual sense of routine during the entire class. Expectations and instructions were spoken before the activity. Transitions to the objects under observation seemed congested and students were loud and somewhat off task. Data that was collected by the students during their observations of seedlings and colored celery stalks was then discussed in groups of three or four. Next, the students returned to their desks to answer the questions for the chapter in the textbook. This was more of a hands-on observation activity in a traditional classroom. Safety goggles were not needed, but were available in the closet. Materials for the activity were ready and available for easy access.

Laura

Laura, a middle school science teacher at CS2, had a casual sense of routine during the entire class. Verbal expectations and instructions were given before the activity. Students had a handout that had to be completed after the activity. Transitions were somewhat congested as some students were finished with the experiment quicker than others. Students worked independently through the steps at the counter. The project was set up on the counter top as

students moved through the stages of making slime. As students finished making slime, several began to play and bounce it off the walls, many were talking loudly, and some were writing the review paper. Safety goggles were not needed, but were available in the cupboard. Materials for the activity were ready and available, for easy access.

Table 4

SMOP Observations

	Characteristic/Routine	Time/Transition	Collaboration	Safety	Materials
Beth	5	5	5	2	5
Kathy	5	3	4	2	5
Mandy	3	2	3	2	5
Laura	3	2	2	2	5

Textural Description

Textural description is in essence the "what" was experienced according to Creswell (2007). Moustakas' (1994) transcendental phenomenological reductionism, is a process of finding patterns and themes from the statements in interviews, classroom observations, and school documents. Moustakas (1994) describes textural description in phenomenology as a description of what the participant experienced in the environment. Each participant experienced IBI in their environment uniquely and in ranges from a strong experience to a weak experience. Each teacher has a style of teaching that is different from the other, but IBI is a teaching style of pedagogy that is taught or trained and is reproducible. Beth has the most documented experience with IBI, has been trained in it, invested in the curriculum, and has no text book, but rather pamphlets for more information when needed.

For the teachers, what Kathy and Mandy experienced, is that each have a knowledge of IBI, but have had little training, yet expressed a desire to learn more. Laura's experience is the weakest description of IBI, as the description of IBI comes from what she has heard about IBI and implements strategies that the principal of the school suggests along with her own hands-on ideas for teaching in a PBL style. The teachers' experiences is different from the administrators' in some ways.

As for the administrators, what Annie, Jack, Joe, Brenda, Mary, and Lana experienced is going to be different by nature since these are not in the classroom, but rather responsible for the decisions and choices the teachers make. Annie, a curriculum coordinator and former teacher, has an understanding of IBI, yet has never implemented IBI in a science classroom as a teacher. Jack's experience as a principal of middle school holds the belief that the teacher is in charge of the classroom and is responsible to meet the needs of the students whether that is through IBI or some other model. Jack states,

> "I think what we will do is to continue to encourage our teachers to implement strategies that are effective for our students. IBI can be a wonderful method. I think sometimes project based can also be, but whatever the teacher's view is the best method for that particular topic or unit, um they need to really evaluate for themselves and just do what best meets the needs of the kids" (Personal communication with participant, 2017).

Joe, a principal, has not experienced IBI and is waiting for a teacher to bring the concept to him when he says,

> "I don't have a plan to implement. I'm waiting for a teacher with experience to take the initiative" (Personal communication with participant, 2017).

Mary, a principal, believes her teachers are implementing IBI whenever questions are being asked either by the student or the teacher when she says,

> "All our lower-level classes are involved in teaching and learning with information being provided. With children being able to ask questions and teachers being able to ask the students questions, and return with the teachers being able to expand their knowledge and taking them from simple questions into higher order thinking skills. As students get older, the depth of knowledge is broadened through the higher order thinking skills and through the asking of questions. Students in turn are the ones to lead discussions and to provide more information based on their understanding and their perceptions." (Personal communication with participant, 2017)

Lana, a principal, has not experienced IBI and does not have a plan to implement it in the future. Lana agrees the teachers may implement the IBI teaching strategy, but currently, from the interview and school documents, one could conclude few teachers are implementing IBI.

Structural Description

Structural description is in essence the "how" of the experience according to Creswell (2007). Determining how each participant experiences IBI requires time analyzing the observations, interviews, and school documents. How is each participant influenced by the phenomenon? The ideas extracted from statements and themes determine how each participant experience IBI.

Training and Professional Development

The main influence regarding how the teachers experienced IBI was training and professional development. The stronger IBI teachers knew how to implement IBI due to formal education, training, or from professional development. Beth says,

> "That's the way that I was taught all throughout my science experience in elementary school and high school. I went to an all science high school and then I was taught that way when I went to the university. All of my teacher training in science has been in IBI" (Personal communication with participant, 2017).

For the weaker IBI teacher who does not understand IBI, Mandy says,

> "I do like the IBI method and I love using it in the classroom. I would love to have more training in the method because I don't feel like I have a very good understanding of exactly how it's used. I think I use it somewhat, but probably not as much as I would like to, and then also I guess just trying to come up with a way financially to be able to support it in the classroom as well" (Personal communication with participant, 2017).

Kathy, an IBI teacher who is not 100% implementing IBI says,

> "Several years back I attended some Sweetbriar conferences and took a class on IBI and it revolutionized the way that I teach in my class. I tried to make my labs more inquiry-based for the students so they are discovering as they go. You end up seeing more moments where they're surprised and the information is stored longer because of that surprise" (Personal communication with participant, 2017).

Last, the weakest IBI teacher, Laura, says,

> "I don't know that I am consciously doing that, but what I have done if I see an interest that a student has that is shared by a few other students we will kind of go off in that direction as long as it applies to the subject that we're studying" (Personal communication with participant, 2017).

Administrators also reveal how they are experiencing IBI through training with the following statements: Annie indicates IBI requires training by saying,

> "I have found a lot of great resources through some of the conferences that I have attended through professional development opportunities and there are many resources available, especially related to project-based learning and many of those ideas can translate over to IBI" (Personal communication with participant, 2017).

Jack refers to training when he says,

> "To my knowledge we have not had a great deal of training on IBI here at LCA. It has been more teacher led in the individual classrooms from their experiences and those kinds of things. The biggest thing is to train our teachers to think critically as to how can we do things better to better meet the needs of our students in the classroom to truly learn the information when it is presented" (Personal communication with participant, 2017).

Training is one of the hindrances to implementing IBI when Brenda says,

> "I think probably just the training for the teachers, the money it would take to do that, the guidance to develop a program like that, and perhaps even materials. I think probably financial would be the first consideration, getting the training, paying for that training, and doing it. I've been in a little bit smaller school and there probably are other things that are preempting that particular focus at this point. I think my only exposure probably is just through a Christian Schools International course where there are presenters at workshops discussing it and using it in other schools. I'd certainly like to learn more about it and see how it could be implemented. Teachers would need to be trained and I'd be interested in that because I do believe it is probably more authentic for the students learning and would be helpful for more engagement and higher scores" (Personal communication with participant, 2017).

Joe very succinctly says, “Lack of training has kept me from implementing” (Personal communication with participant, 2017).

Mary says,

> “We have teacher trainings where we have a specialist in the area among our staff who work with staff during the workweek. We'll talk about the text we use, and how they are best utilized, and how you can add things to them. Teachers know their classes best” (Personal communication with participant, 2017).

Lana says, “We are simply not implementing and not there is not enough information on it” (Personal communication with participant, 2017).

In conclusion, training and professional development are the number one influencers greatly affecting how teachers and administrators alike are experiencing the implementation or non-implementation of IBI.

Research Questions

Research question one: If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom? Data collected from observations, and school documents, indicates that teachers, curriculum coordinators, and principals view IBI differently. Overall, IBI is fully implemented in only one teacher’s classroom while other school constituents are either undecided or implement IBI periodically.

Research question two: What are curriculum coordinators, teachers, and principals’ perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school? Overall, curriculum coordinators and principals believe IBI is beneficial, but

in most schools teachers have a choice as to what pedagogy they use to teach concepts and many of the teachers were not familiar nor were they fully trained in IBI to fully implement it in their classroom.

Research question three: What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI? In the school documents of objectives, each set of standards were examined for IBI word indicators such as inquiry, measurement, experiment, formulate, investigate, test, modify, hypothesize, discover, create curiosity, scientific method, data, labs, and explore. Of all the objectives, 72 out of 255 objectives indicated IBI. Lesson plans submitted for the study, did not indicate any IBI. The environmental factors of the classrooms such as a sink with running water, and cabinets for lab equipment did not seem to make much of an impact on IBI implementation. All four science rooms had a sink, but that did not mean the teacher implemented IBI 100% of the time.

Research question four: What situations or training have influenced IBI implementation? Clearly, all four teachers had different training and experiences with IBI and view IBI differently. The one teacher that was trained extensively in IBI as well as experienced IBI first hand while growing up was the one teacher who displayed the most IBI characteristics. Two teachers who received limited professional development courses use IBI intermittently. The fourth teacher did not receive any IBI training and mainly utilized hands-on experiences with little inquiry implementation.

Composite Description

In review, Creswell (2007) describes the final stage of analysis as writing "a composite description that presents the 'essence' of the phenomenon" (p. 62) in one to two long paragraphs that leave the reader with a deeper understanding of the experience. Polkinghorne (1989), says,

The reader should come away from the phenomenology with the feeling, "I understand better what it is like for someone to experience that" (p. 46). The final composite description, or the common experiences of the participants is written from both the textural and structural descriptions in words explaining what the participants had in common (Creswell, 2007, p. 62). In summary, the steps of data analysis included grouping all experiences relevant to the phenomenon, clustering like experiences, labeling the horizons with common themes, and finally using the transcriptions to construct textural and structural descriptions of the essence of the experiences of all participants, which lead to the development of composite description of the meanings. In essence, the phenomenon of IBI being implemented in the middle school science classrooms of the Christian schools, included four main identified themes: awareness, benefits, hindrances, and resources.

Awareness

The first theme from the interviews was awareness. It became quite evident that eight out of the ten interviewees had an awareness of IBI. Next, classroom observations revealed each teacher's knowledge and beliefs regarding IBI through the way the classroom was set up as well as conducted. Only one classroom had structured centers with students acting like scientists with questions for inquiry and data notecards for recording their findings through experimentation. Finally, the school documents were predominantly grounded in objectives that lead to knowledge through classifying and identifying the concepts in science. All constituents have an awareness of IBI.

Benefits

Another emergent theme from the interviews was the benefits of IBI. The interviews showed significant evidence that ten out of the ten interviewees had an understanding of the

benefits of IBI, yet the classroom observations did not demonstrate that IBI was successfully implemented because the classrooms were not set up for IBI, nor were the projects geared towards discovery, rather they required observation. School documents mirror predominantly traditional teaching methodology with objectives such as identify, understand, and know.

Hindrances

From the interviews, hindrances toward implementing IBI were predominant. It became quite evident that ten out of the ten interviewees had a belief that the implementation of IBI requires expensive training and therefore hinders the implementation of IBI in the classroom. Additionally, classroom observations revealed hindrances through the lack of supplies, facilities, and teacher implementation of IBI. Finally, the school documents show predominance in traditional teaching methodology with objectives such as identify, understand, and know. All participants believed there were hindrances to implementing IBI

Resources

Resources from the interviews show belief of ten out of the ten interviewees have the implementation of IBI required expensive resources for the full implementation of IBI in the classroom. Classroom observations also demonstrated the possible lack of IBI implementation due to a lack of funding for the curriculum, training, and supplies that IBI requires to conduct labs in the middle school science classroom. Last, the school documents did not demonstrate objectives that indicated IBI.

Overall, the phenomenon of IBI being implemented in the middle school science classrooms of the Christian schools, includes four main themes: awareness, benefits, hindrances, and resources. Teachers are somewhat aware of IBI and realize the benefits of IBI, but cannot fully implement this teaching style due to hindrances such as lack of knowledge, training, and

resources such as curriculum and supplies. If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then why is IBI not being implemented 100% of the time in the Christian middle school science classroom? Curriculum coordinators, teachers, and principals' must take the lead in understanding IBI for full implementation in the middle school science classroom in a Christian school. IBI strategies were not predominantly found in school documents, lesson plans, nor environmental factors that support IBI. Intentional situations and training must be pursued by both administrators and teachers to have full implementation of IBI.

Summary

After the study was conducted, and all the available data had been gathered, six themes were identified as major influencers on IBI in the classroom. Polkinghorne (1989), says, the reader should come away from the phenomenology with the feeling, "I understand better what it is like for someone to experience that" (p. 46). From this study, six themes were identified.

The first theme was teacher-student relationship which is vital to the IBI experience due to the amount of constructivism and collaboration needed in this scientific process of experiments and hands-on learning. Relationship is crucial for students feeling comfortable to ask questions about the objectives which in turn creates curiosity to prepare the mind for the IBI classroom. Next, the use or non-use of textbooks in the classroom will neither dictate IBI, nor will textbooks indicate the use of IBI.

Then, textbooks were identified as being used by some teachers as a resource only, yet one teacher, one that is strong in IBI, only uses labs and notebooks with some informational pamphlets. The benefits of IBI include critical thinking, longer retention of concepts, the gaining of life skills, higher level thinking, independent thinking, improved scores, a deeper

understanding of the concepts, real world connections, and relationships are built. Students are more engaged while learning, thus developing a love for science after implementing IBI in the classroom.

Another theme is IBI awareness. Without proper training, IBI awareness is quite low. Nine out of 10 participants demonstrated little understanding of the true essence of IBI. Several thought they understood, but the actual implementation of IBI objectives and interviews revealed otherwise. While teachers are free to choose how to teach the concepts, teacher choice is another theme that was identified. With limited training in IBI, most teachers were unsure if they could fully implement IBI as a sole teaching method. If teachers do not implement IBI in the elementary classes then it will be more difficult to continue in middle school. Administrators are waiting for teachers to bring the program to administration before fully implementing the IBI model. Some think that IBI is not compatible with life science and tend to lean toward projects and textbook implementation. One administrator and teacher argue that whether a teacher chooses PBL or IBI, the main goal is to choose what is best for the needs of the students. IBI is avoided due to hindrances such as: IBI requires a variety of instruction, needs some direct instruction by the teacher, is mostly questions and activities, and IBI often seems insurmountable and out of reach. Teachers are not likely to choose IBI for these many reasons.

A final theme is hindrances. Teachers and administrators are hindered from implementing IBI for several reasons: The school budget may not allow for full implementation of an IBI classroom, it is labor intensive, requires hours of planning and can be time consuming. Another hindrance is due to the level of professional development that is needed. Three teachers and three administrators agree that professional development, if not readily available, may present a deterrence to IBI, and will be more likely to resort to hands-on science which may

serve the purpose just as well as IBI. The major hindrance is simply the fact that many do not truly understand what IBI entails. Brenda, Laura, and Lana did not understand what IBI was before this study. Hindrances may be valid, but are definitely viable.

CHAPTER FIVE: DISCUSSION

Overview

In the twentieth century science education, research indicates that a lack of Inquiry Based Learning (IBI) within the teaching standards, may result in a decline in student motivation, interest, and learning (Vega & Brown, 2013; Zhao, 2011). Teacher and principal beliefs and choices in the classroom are based on several factors that may or may not be within the control of these two constituents. The traditional classroom is directly affecting student learning (Bhattacharyya, 2009; Vega & Brown, 2013). A probable cause for lack of student engagement may be contributed to teachers and students passively utilizing a textbook in a traditional classroom, instead of being actively engaged in interactive projects (Vega & Brown, 2013) such as IBI. IBI is often misunderstood as hands-on projects (Crawford, 2000), but it is much more. IBI is "A teaching method that combines the curiosity of students and the scientific method to enhance the development of critical thinking skills while learning science" (Warner & Myers, 2008, p. 3), coupled with constructivism which occurs when students construct understanding for themselves (Lowery, 1997). The National Research Council (NRC) is seeking ways to incorporate science reform in the 21st century science classes (NRC, 1996) to include IBI and constructivism.

This qualitative phenomenology design is most suitable for this study on Christian school implementation of IBI for middle school science instruction. Moustakas (1994) describes this transcendental approach to phenomenology as a description of the experiences of the participants. The purpose of this study was to consider the shared experiences of CMSST and gain insights from the teachers who are or are not currently experiencing the phenomenon of IBI in the classroom. Max van Manen (1990) explains that phenomenology desires a deeper

understanding "of the nature or meaning of our everyday experiences" (p. 9). Five Christian middle schools from the Association of Christian Schools International (ACSI) in central Virginia was selected. Data collection strategies included teacher and principal, and curriculum coordinator interviews, classroom observations, and school document reviews (Moustakas, 1994). Data analyses include clustering common themes, constructing textural, structural, and finally, a composite description (Moustakas, 1994).

A Summary of the Findings

The four research questions for this phenomenology on the implementation of IBI in the Christian middle school science curriculum guided this study.

1. If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom?
2. What are curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school?
3. What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI?
4. What situations or training have influenced IBI implementation?

Discussion of the Findings

Research Question One Discussion

If teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through

inquiry, then how is IBI being implemented, if at all, in the Christian middle school science classroom? The themes that were identified from implementing IBI were:

1. Teacher choice
2. Textbooks

Teacher choice. Although constructivism is gaining acceptance, the beliefs from the community and school constituents are embedded in traditional education of straight rows, worksheets, and lecturing (Armstrong, 1994) and the constructivist classroom may meet some resistance until the beliefs among the community and school constituents change to include IBI as a valid teaching method. "Constructivism is one of the primary strands guiding contemporary science reform" (Haney et al., 2003, p. 366). Beth, from CS1, began teaching at CS1 eleven years ago. At the start, the curriculum was textbook driven and in 2012, Beth decided to take the curriculum to IBI using a NASA lab based curriculum. The proposal was made to administration, and the curriculum was purchased for Beth to fully implement IBI. The results of this choice may have resulted in higher student motivation and achievement as witnessed through student engagement in the labs and end of the year testing. Students are highly engaged in the lab bases IBI classroom and the end of the year test results indicate student learning is significant.

Again, Attitudes form beliefs and from beliefs, and from attitudes and beliefs, actions are birthed which is why "beliefs become a crucial change agent in systemic school reform" (Cuban, 1990; Haney et al., 2003, p. 367). Pajares (1992) realized that beliefs are rarely altered during adulthood, which is why changing a teacher's belief about IBI in the classroom is the only way to reform science education (Bybee, 1993; Cuban, 199; Fullan & Miles, 1992; Tobin, Tippins, & Gallard, 1994). Parjares (1992) also found that "changes in adulthood are rare" (Haney et al.,

2003, p. 367). As Haney, Czerniak, and Lumpe, (2003) stated, "The constructivist belief structures of teachers, administrators, parents, community members, and students" (p. 367) need to be altered for constructivism reform to be accepted using IBI in the classrooms.

Textbooks.

A second theme that was identified from this question was textbooks. Textbooks are important, no doubt, but in IBI the textbook is not the center of the lesson. Haney, Lumpe, and Czerniak, (2003) agree that "Textbooks guide the teacher by giving concepts and standards from which they design projects to be an instructional designer and trainer; a coach instead of a lecturer" (p. 368). In IBI classrooms, teachers serve as mentors, models, and facilitators to the students; however, they are still in charge of their classroom. According to Vygotsky, teachers who facilitate IBI perfect the strategies of pondering, wondering aloud, and reflecting questions back to children (Vygotsky, 1978) and this is the essence of IBI.

On the contrary, Galtekin (2005) reiterates that although student motivation has roots in IBI for the majority, there is no choosing of projects or concepts without the printed material, standards, or libraries. A library has resources that can be used to explore culture and history which helps students become more engaged and can lead to student-generated questions and search strategies. Those textbook resources provide the basis from which projects are designed and researched (Gulbahar & Tinmaz, 2006).

In conclusion, if teachers are responsible for the activity and methods choices they use to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then it is apparent that IBI is not fully implemented. Some of the teachers and administrators still believe that the sole use of the textbook in the classroom potentially impedes the implementation of IBI.

Research Question Two Discussion

What are curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school? The themes that were identified for the perceptions of implementing or not implementing IBI were:

1. Awareness
2. Hindrances

Awareness. All participants were aware of IBI, but several had to research the meaning of IBI before the interview. Teachers seem to be aware that IBI is positive for all, it is time consuming, labor intensive for users, and may be limited without resources. Overall, teacher and administer alike are keenly aware of the cost, time, and knowledge involved in implementing IBI. All participants also agree that IBI increases learning, interest, and motivation to learn. In addition, many participants believe IBI develops critical, and independent thinking on a higher level, builds life skills, connects to real world, builds relationships, deepens understanding, develops a love for science, is student centered, and meets the standards. Therefore, as stated previously, diverse instructional approaches such as IBI, are not widely accepted if the belief about IBI is limited. According to Haney and Lumpe (1995), professional development for principals, teachers, and curriculum coordinators greatly increased the awareness and acceptance of IBI methods. However, it is critical for the implementation that all participants in the educational process be included in the professional development experiences (Haney et al., 2003). "If it is true that teachers and administrators adopt more positive constructive beliefs through their involvement in effective professional development opportunities, the parents, community members and students will likely benefit from these experiences, is as well" (Haney, et al. 2003, p. 374). Also, Haney, Czerniak, and Lumpe, (2003) said, "It's imperative that the

decision-making to citizens are not only presented with accurate information based on classroom research regarding teaching and learning, but they're invited into the schools to see these ideas operation of the compactly involved with these constructivist practices" (p. 374). Making CCs, teachers, principals, parents, and the community aware of IBI, its purpose and strengths, is one key to implementing IBI in the classroom.

Hindrances. Although participants are likely to implement IBI, there are yet hindrances to fully implementing IBI. Some of the hindrances were discussed in the interviews such as: Costly budget restraints, labor intensive, time consuming, professional development required, hands-on is better, not sure what it is, and hours of planning. Hindrances to IBI are valid and must be addressed before fully implementing IBI.

In review, all participants were aware that IBI prepares the learning atmosphere to include problems and projects which allows students to teach others what they have learned since students remember 100% of what they teach (Krajcik, 2015, McLeod, 2007). They also are aware that students feel trapped by boredom and monotony which suppresses learning for the majority (Alacapinar, 2008). Research shows that students who are instructed in IBI display organization and management skills with varying degrees of academic success, thus meeting student needs to self-actualize by providing increased socialization, requiring students to take ownership in learning (Krajcik, 2015). All in all, curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI are positively aware and are highly favorable implementing this teaching model, but are impacted significantly by the hindrances that are inherent in the full implementation of IBI.

As previously described by Pea (2012), an IBI classroom will have work stations, safety equipment, and many types of materials for conducting experiments which include the need for

test tubes, chemicals, burners, dishes, and more. In addition to the supplies, there are also paper and pencil supplies needed for recording data, making inferences, drawing conclusions, and making solutions (p. 42). Principals are responsible for the purchase of such items and without the support of this important constituent the IBI process may be hindered.

In conclusion, curriculum coordinators, teachers, and principals' perceptions of implementing or not implementing IBI in a middle school science classroom in a Christian school is directly tied to the awareness that teachers have regarding IBI and the number of hindrances that are present. Since the IBI classroom requires expensive equipment, intricate planning of stations, detailed record keeping, and administration and teacher buy-in, it is no wonder that IBI is perceived as costly, labor intensive, and time consuming.

Research Question Three Discussion

What IBI strategies are found in school documents, lesson plans, or environmental factors that support or limit IBI? The theme that was identified from the school documents and environmental factors was identified as:

1. IBI indicators

The strategies found in the goals and objectives were very telling and revealing of the agenda that teachers have during planning. IBI indicators were the actual objectives or the verbs in each goal listed. Goals and objectives that were sent from four of the schools were printed, and the objective was underlined. Each objective was counted and recorded in Table 2. The indicators revealed that IBI was present in few grades, but the majority of the schools and objectives were indicative of traditional teaching. Teaching and curriculum goals are the key to steering the learning in the lesson as teachers use the curriculum, standards, and text to choose

topics from which a hands-on experience is presented with the intent of stimulating curiosity (Leypolt, 1998).

In one study the principals received positive feedback for being supportive and "providing materials needed to be successful, and in some cases, were given too much" (Pea, 2012, p. 42). Not only were supplies readily available, this county had a high priority placed on IBI science teaching in the standards (NRC, 2011). When IBI indicators are written in the goals and objectives, IBI should then be the focus and lessons should be centered around inquiry and experimentation while using the scientific method in a social setting.

Finally, IBI data strategies are found in school documents, lesson plans, or environmental factors that either provides support or limit IBI from being fully implemented in the classroom. However, if IBI is not in the standards, it is highly unlikely that IBI was used in the teaching process. All planning for IBI begins in the standards. Therefore, revisions to standards is the beginning of implementing IBI.

Research Question Four Discussion

What situations or training have influenced IBI implementation? The themes identified from the data regarding training were:

1. Professional development
2. Relationship

Professional development. Professional development and support from the administration for implementing IBI since inquiry is not a natural occurring pedagogy teaching method in most classrooms. Again, the implementation of IBI in the classroom may be a challenge due to lack of teacher knowledge and professional development, funds, equipment, and facilities (Bandura, 1997; Ford, 1992). The challenge of implementing IBI is a driving motivator

for this study, but where there is training and support from the principal, IBI has the opportunity to bring success for all involved (Onofowora, 2004). Without PD and support from the administration, it is highly unlikely that IBI was implemented successfully.

Relationship. Building relationships with students is part of Maslow's Hierarchy of Needs (Maslow, 1943). When students do not feel important, respected, or connected, there is a potential mental block that prevents learning. "Develop supportive relationships between student and teacher for support" (Page & LeBeau, 2006, pp. 42-46) in the IBI setting to create an atmosphere of acceptance. In aligning with Irvine (2015), survival for the constituents would include a safe, secure, nourishing environment. Mutual trust between the student and the teacher, coupled with positive affirmation and class discussion were ways to foster a safe and secure atmosphere (Irvine, 2015). When there is trust and respect, students feel safe to share their ideas and ask questions without fear of ridicule or judgment. Again, students need to feel a sense of belonging that is fostered through social interactions (Maslow, 1943).

All in all, situations and training that influence IBI implementation include professional development and healthy relationships. Without the professional development, teachers tend to shy away from IBI. Healthy relationships that produce trust and respect allow for the freedom of inquiry and discussion in a safe environment. Without professional development, trust, and respect, IBI was influenced for the negative and was highly unlikely to be implemented in the classroom.

Theoretical Implications

As previously stated, foundationally, IBI is based in kinesthetic learning through questioning and doing (Vega & Brown, 2013). Vega & Brown (2013) studied how the implementation of IBI has educational significance as opposed to direct instruction and the

traditional classroom experience. Armstrong (1994) revealed, "For most Americans, the word classroom conjures up an image of students sitting in neat rows of desks facing the front of the room, where a teacher either sits at a large desk correcting papers or stands near a blackboard lecturing students" (p. 86). IBI thus prepares the learning atmosphere to include problems and projects which allow students to teach others what they have learned. Students remember 100% of what they teach (McLeod, 2007). As Alacapinar (2008) recalls that textbooks may inhibit teachers from being the instructional designer and trainer and students feel trapped by boredom and monotony which suppresses learning for the majority. Students that are instructed in IBI display organization and management skills with varying degrees of academic success, thus meeting student needs by providing socialization which offers students the opportunity to self-actualize and take ownership in learning (Krajcik, 2015). Dewey's (1938) Constructivism, and Vygotsky's (1973) Social Constructivism and Glasser's (2005) Choice Theory are the three theories grounded in IBI that drove this study.

Dewey

Dewey's (1938) Constructivism is seen in the IBI classroom as students experiment, observe, and collect data from hands-on experiments. Overall, the teachers from the five schools agree that constructivism is the superior form of teaching, but also believe there is still a place for direct instruction and textbook use as a resource with the exception of Beth from CS1. Interviews, observations, and school documents all indicated a desire for kinesthetic learning through doing in each school. In review, IBI has become a popular concept among the science education community, and many of the articles in literature support the idea that constructivism in the classroom is superior to simply learning from a textbook alone (Fensham, Gunstone & White, 1994; Shapiro, 1994; Tobin, 1993). Secondly, there is firsthand evidence that IBI has

beneficial effects on standardized tests (Vega & Brown, 2013). Dewey's Constructivism drives the IBI model.

Vygotsky

Vygotsky's (1973) Social Constructivism is seen in all the classroom observations in this study as students partnered into groups to observe the experiment in CS1 seventh science, and CS1 eighth science, and CS2 sixth science. However, CS1 sixth science classroom had both the Dewey and Vygotsky models in action while students were not only observing, but they discussed together and made decisions together regarding the questions at each of the six stations with experiments. Joe, on the contrary, in CS3, had reservations about the social constructivism in IBI model. Joe is concerned that the social aspect of IBI would become disruptive and take away class control from the teacher. In review, Vygotsky (1978) states it is because of a desire to socialize that students are motivated to learn in social environments. Since students enjoy teaching each other, and can model learning processes while increasing knowledge (McLeod, 2007), then the end goal of social constructivism in IBI and problem based learning is for students to create a collective product that is greater than the individual contributions (Vygotsky, 1978). The impulse for self-expression can be channeled into a learning experience as students desire to teach each other and to express original ideas, creations, feelings, and values in a social setting (Powell & Brown, 2011). Since students desire to teach each other and to express original ideas, creations, feelings, and values in a social setting, it is because of this desire that students are motivated to learn in social environments. In the IBI classroom, students create a collective product that is recognizably greater than their individual contributions. Students enjoy teaching each other, and they can model their learning processes while increasing knowledge (Pea, 2012). Social Constructivism is another driving force in the IBI model.

Glasser

Glasser's (1998) Choice Theory is relevant in all five schools and is represented especially in CS1. Beth began teaching at CS1 when the curriculum was textbook driven. After two years, she realized the students were not learning and they were bored with science. Since her training in IBI was so prevalent, she brought the idea of teaching IBI in her classroom to the administration. After consideration and research, the new curriculum was purchased for the sixth grade at CS1, and since then, students are more engaged and scores on the Terra Novas have consistently reflected higher learning. In reflection, IBI has become a popular concept among the science education community, and many of the articles in literature support the idea that constructivism in the classroom is superior to simply learning from a textbook alone (Fensham, Gunstone & White, 1994; Shapiro, 1994; Tobin, 1993). There is firsthand evidence in Beth's classroom that IBI has beneficial effects on standardized tests (Vega & Brown, 2013). Therefore, the teacher is the chief change agent in the reform toward IBI in the classroom.

Recommendations for Future Research.

A recommendation for future research in the area of Christian school elementary and high schools implementation of IBI would be a great next study for the implementation of IBI. This would also allow for more opinions and/or possible data to prove that IBI does indeed produce more learning and higher test scores. Next, a comparison between public and Christian schools implementation of IBI would provide insight and information on the cost, amount of time, and support of administration that is required for total implementation of IBI. Last, studying grants for IBI in the classroom would be helpful for administrators to see how best to budget for the implementation of IBI. For example, one such grant is The Eisenhower project, which was created to introduce the concept of IBI to the community. The participants included

teachers, administrators, parents/community members, and high school students. The goal was to make the community more aware of IBI programs so that the parents would be more receptive to teachers using IBI in the classroom.

Delimitations and Limitations

Delimitations

This study had delimitations purposefully made to include participants over the age of 18 to prevent Internal Review Board (IRB) delays in executing the study. I was in the classrooms to observe teachers only with male and female students of adolescent ages 11, 12, and 13, in grades six, seven, and eight. A smaller sample size was necessary to collect rich and in-depth data collection (Creswell, 2007). The schools asked to participate were local Christian schools in the central Virginia area. The participants were the sixth, seventh, and eighth grade science curriculum coordinators, teachers, and principals, and they were schools that had similar mission statements since the schools had to be part of the ACSI. The study was by grade and subject to include only middle school grades in the field of science. Schools were chosen to be near my location for ease in traveling for the classroom observation visits.

Limitations

Christian schools with similar mission statements are expected to present some limitations in diversity. Being from the same geographic area, there is a possibility that the participants would not be demographically diverse. Another weakness may include generalizability as this is a small sample size. Rich feedback may be hindered if teachers have little to no knowledge of IBI. Bracketing was utilized due to my personal viewpoints of the importance of IBI.

Summary

The NRC (1996), SFAA (Rutherford & Ahlgren, 1993), and the BSCS have all recommended constructivism is "an intricate aspect of curriculum reform" (Haney et al., 2003, p. 366). Research reveals that constructivism in curriculum reform enhances the science student through increased reasoning and higher motivation which occurs when teachers exercise responsible choices (Shillingford & Edwards, 2008) to implement IBI (Thornton, 2012). On the contrary, Armstrong (1994) found that implementing constructivism may meet administration and teacher resistance when the traditionalists, those who view the classroom as rows of quiet students lectured by a teacher from the front of the classroom, view the constructivist ideologies as ineffective and disruptive. The four research questions have answers that bring understanding to why IBI is or is not implemented in the Christian middle school science classrooms.

First, if teachers are responsible for the activities and methods used to teach standards, and students typically test higher in reasoning skills as a result of IBI, the question remains, why is IBI not being implemented in every Christian middle school science classroom? Ultimately, teachers were not fully aware of the true essence and meaning of IBI and textbooks and projects are easier to implement.

Data revealed that curriculum coordinators, teachers, and principals' perceptions of IBI, have a definite influence on teacher choice to use or not use IBI in the classroom. Awareness of IBI was present to all participants, and the hindrances were ominous to both teachers and administrators. However, awareness of and fully understanding IBI is the difference between implementing and not implementing this teaching model. All constituents need to buy-in and gain a solid understanding through professional development and training in IBI. Also, the hindrances will become less ominous when the administration is able to support IBI with school

budget supplies and curriculum purchases and allow more time in schedules and planning to accommodate IBI.

IBI strategies may have been found in school documents, lesson plans, and classroom observations, but that was not an indicator that IBI was practiced on a daily basis by the teacher. While environmental factors such as a sink in the classroom, cupboards containing experiment supplies, and goggles, were found in the four classrooms, this did not indicate IBI was the sole choice of teaching strategy. Standards, or goals and objectives need to be deliberately designed with verbs that indicate IBI. When the standards are revised, the lessons will reflect IBI.

As a result, the deciding factor for influencing IBI in the classroom is the amount of professional development and training for teachers and administrators in inquiry instructions practices. Administrators who buy-in to IBI strategies and train the teachers in these strategies will have the strongest IBI teachers, IBI lesson plans, IBI environment, thus resulting in higher student engagement and learning in the twenty first century Christian middle school science classrooms.

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Appendix A

IRB Approval Documentation

The Liberty University Institutional Review Board has approved this document for use from

1/13/2017 to 1/12/2018 Protocol # 2703.011317

CONSENT FORM

A QUALITATIVE PHENOMENOLOGY OF CHRISTIAN MIDDLE SCHOOL

IMPLEMENTATION OF INQUIRY-BASED SCIENCE INSTRUCTION

Patricia Ann Ferrin
Liberty University
Department of Education

You are invited to be in a research study of Inquiry Based Instruction (IBI). You were selected as a possible participant because you are a teacher of an ACSI Christian middle school. I ask that you read this form and ask any questions you may have before agreeing to be in the study.
Patricia Ferrin, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information:
The purpose of this study is to explore curriculum coordinators, teachers, and principals' implementation of Inquiry-Based Instruction (IBI) in Christian middle school science classes.

Procedures:
If you agree to be in this study, I would ask you to do the following things:
1.) Participate in a 30-60 minute interview and follow up. One-on-one interviews were audio taped to ensure verbatim transcriptions. Follow up interviews are necessary to establish credibility for the participant's narrative. Transcriptions were included and each participant will be allowed to read their responses and field notes for accuracy.
2.) Teachers or principals will provide lesson plans with goals and objectives from semester one for each grade.
3.) Allow up to three 50-minute classroom observations for each middle school science class.

Risks and Benefits of being in the Study:
The risks for this study are no more than the participant would encounter in everyday life.
There are no direct benefits to participating in this study.

Compensation:
You will not receive any compensation for taking part in this study.

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

copies, which will be kept in a locked cabinet. All data collected is strictly confidential, and pseudonyms will be assigned to all participants. The Liberty University Institutional Review Board has approved this document for use from 1/13/2017 to 1/12/2018 Protocol # 2703.011317

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time.

How to Withdraw from the Study:

If you choose to withdraw from the study, please contact the researcher at the email address below. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.

Contacts and Questions:

The researcher conducting this study is Patricia Ferrin. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at paferrin@liberty.edu. You may also contact the research's faculty advisor, Dr. Steve McDonald, at samcdonald2@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, Green Hall 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

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

Statement of Consent:

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

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

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

Signature: _____ Date: _____

Signature of Investigator: _____ Date: _____ The Liberty University Institutional Review Board has approved this document for use from 1/13/2017 to 1/12/2018 Protocol # 2703.011317

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

January 13, 2017

Patricia Ann Ferrin
IRB Approval 2703.011317: A Qualitative Phenomenology of Christian Middle School Implementation of Inquiry-Based Science Instruction

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

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

Sincerely,
G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research **The Graduate School**
Liberty University | Training Champions for Christ since 1971

434-522-0506

INVESTIGATOR AGREEMENT & SIGNATURE PAGE*

BY SIGNING THIS DOCUMENT, THE INVESTIGATOR AGREES:

1. That no participants will be recruited or entered under the protocol until the Investigator has received the final approval or exemption email from the chair of the Institutional Review Board.
2. That no participants will be recruited or entered under the protocol until all key personnel for the project have been properly educated on the protocol for the study.
3. That any modifications of the protocol or consent form will not be initiated without prior written approval, by email, from the IRB and the faculty advisor, except when necessary to eliminate immediate hazards to the participants.
4. The PI agrees to carry out the protocol as stated in the approved application: all participants will be recruited and consented as stated in the protocol approved or exempted by the IRB. If written consent is required, all participants will be consented by signing a copy of the approved consent form.
5. That any unanticipated problems involving risks to participants or others participating in the approved protocol, which must be in accordance with the Liberty Way (and/or the Honor Code) and the Confidentiality Statement, will be promptly reported in writing to the IRB.
6. That the IRB office will be notified within 30 days of a change in the PI for the study.
7. That the IRB office will be notified within 30 days of the completion of this study.
8. That the PI will inform the IRB and complete all necessary reports should he/she terminate University Association.
9. To maintain records and keep informed consent documents for **three years** after completion of the project, even if the PI terminates association with the University.
10. That he/she has access to copies of 45 CFR 46 and the Belmont Report.

		11-14-16
Principal Investigator (Printed)	*Principal Investigator (Signature)*	*Date*

FOR STUDENT PROPOSALS ONLY

BY SIGNING THIS DOCUMENT, THE FACULTY ADVISOR AGREES:

1. To assume responsibility for the oversight of the student's current investigation, as outlined in the approved IRB application.
2. To work with the investigator, and the Institutional Review Board, as needed, in maintaining compliance with this agreement.
3. To monitor email contact between the Institutional Review Board and principle investigator. Faculty advisors are cced on all IRB emails to PIs.
4. That the principal investigator is qualified to perform this study.
5. **That by signing this document you verify you have carefully read this application and approve of the procedures described herein, and also verify that the application complies with all instructions listed above.** If you have any questions, please contact our office

		17
Faculty Advisor (Printed)	*Faculty Advisor (Original Signature)*	*Date*

***The Institutional Review Board reserves the right to terminate this study at any time if, in its opinion, (1) the risks of further experimentation are prohibitive, or (2) the above agreement is breached.**

Appendix B

Principal/Administrator Recruitment Form

December 9, 2016

Mr. C

Dear Mr. :

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand Christian middle school implementation of inquiry-based instruction (IBI). The title of my research project is "A Qualitative Phenomenology Of Christian Middle School Implementation Of Inquiry-Based Science Instruction." The purpose of this qualitative phenomenology is to explore the implementation of IBI teaching strategy for the Christian middle school science teacher in Central Virginia.

I am writing to request your permission to conduct my research. Participants will be asked to complete the attached survey. Participants will be presented with informed consent information prior to participating. Taking part in this study is completely voluntary, and participants are welcome to discontinue participation at any time.

Thank you for considering my request. If you choose to grant permission, respond by email to paferrin@liberty.edu.

Sincerely,

Mrs. Patricia Ferrin
LCA Teacher

December 9, 2016

Dear Ms. B:

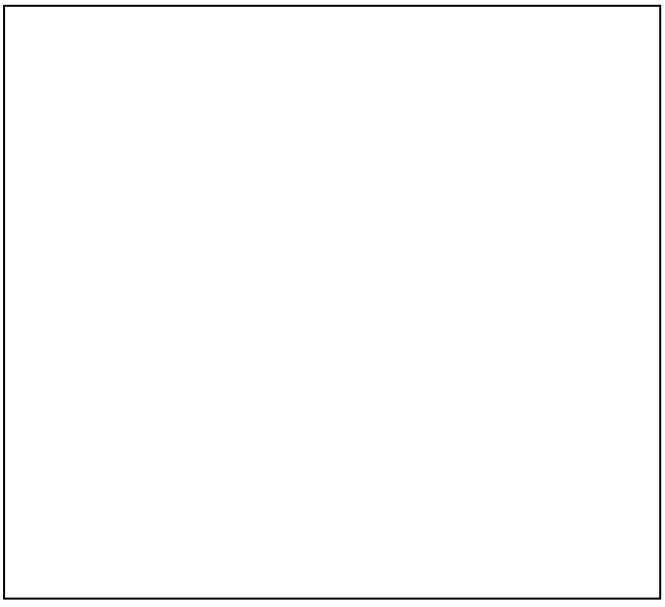
As a graduate student in the School of Education at Liberty University, I am conducting research to better understand Christian middle school implementation of inquiry-based instruction (IBI). The title of my research project is A Qualitative Phenomenology Of Christian Middle School Implementation Of Inquiry-Based Science Instruction. The purpose of this qualitative phenomenology is to explore the implementation of IBI teaching strategy for the Christian middle school science teacher in Central Virginia.

I am writing to request your permission to conduct my research. Participants will be asked to complete the attached survey. Participants will be presented with informed consent information prior to participating. Taking part in this study is completely voluntary, and participants are welcome to discontinue participation at any time.

Thank you for considering my request. If you choose to grant permission, respond by email to paferrin@liberty.edu.

Sincerely,

Mrs. Patricia Ferrin
Teacher



Hi Patty,

This would be fine. What are the dates you're looking at? I will be out of town on Monday and Tuesday (Dec. 5-6) at an ACSI Commission Meeting. Then I will be gone on Friday and Monday (Dec. 9 & 12) to see an ailing 96-year-old mother in TN. So, next week, the only days I will be there are Wednesday and Thursday. Thursday (Dec. 8) is our elementary Christmas program dress rehearsal in afternoon with program at night so things will be very busy that afternoon. ☺

Would Wednesday work to sit down and lay out a plan?

B

K-8 Principal

There are many books that can change your thinking,
but there is only one Book that can change your nature. (MacArthur)

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

Teachers of grades six, seven, and eight who are willing to participate, will be asked to participate in an interview, provide lesson plans from semester one, goals and objectives for the year, and allow me to observe them teaching for one to three non-consecutive class periods. The interviews for teachers, curriculum coordinators, and principals should take about 30 minutes per participant. The participants and all data collected will remain completely confidential.

To participate, please contact me to schedule an interview at paferrin@liberty.edu.

A consent document will be available for you to complete at the time of the interview.

Sincerely,

Patricia Ferrin Ed.S

To Whom It May Concern:

Patty Ferrin has permission to conduct her study for her doctoral thesis at Cornerstone Christian Academy.

Sincerely,

--

Dear Mr. B

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

Teachers of grades six, seven, and eight who are willing to participate, will be asked to participate in an interview, provide lesson plans from semester one, goals and objectives for the year, and allow me to observe them teaching for two to three non-consecutive class periods. The interviews for teachers, curriculum coordinators, and principals should take about 30 minutes per participant. The participants and all data collected will remain completely confidential.

To participate, please contact me to schedule an interview at paferrin@liberty.edu.

A consent document will be available for you to complete at the time of the interview.

Sincerely,

Patricia Ferrin
Ed.S

Patty,
I would be glad to help you. R has new teachers in each grade that you are considering. The newness of the teachers is their hesitation rather than the timing of the year.

I will work on getting the documents together. Do you want the interview answers in print or through an in person interview?

T

I hope your year is productive and well! Due to the limited number of ACSI schools in the area, I have had to alter my study to accommodate more ACSI schools in this area. Your school now qualifies!

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

Since you are a principal at a Christian middle school that is a member of ACSI, and if you are willing to participate, you will be asked to participate in an interview. The interview should take about 60 minutes or less. Your identity and all data collected from you will remain completely confidential.

To participate, please reply to this email with your intent to participate.

A consent document will be available for you to complete at the time of the interview.

In addition, I would like to invite the teachers of the middle school science classrooms as well. They would be asked to interview, allow me to observe in the classroom, and provide lesson plans and objectives from semester one.

Sincerely,

Patricia Ferrin
Ed.S

To: Ferrin, Patty (School of Education)
Subject: Re: study

Yes, I will do an interview - it will need to be the first of next week - will that work?

On Feb 28, 2017, at 8:10 PM, Ferrin, Patty (School of Education) <paferrin@liberty.edu> wrote:

Appendix C
Teacher Participant Recruitment Letter
Teacher Participant Consent Form

Dear Curriculum Coordinator:

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

Since you are a curriculum coordinator at a Christian middle school and if you are willing to participate, you will be asked to participate in an interview. The interviews should take about 60 minutes or less. Your identity and all data collected from you will remain completely confidential.

To participate, please contact me to schedule an interview at paferrin@liberty.edu.

A consent document will be available for you to complete at the time of the interview.

Sincerely,

Patricia Ferrin
Ed.S

Dear Teacher:

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

Teachers of grades six, seven, and eight who are willing to participate, will be asked to participate in an interview, provide lesson plans from semester one, goals and objectives for the year, and allow me to observe them teaching for two to three non-consecutive class periods. The interviews for teachers, should take about 60 minutes or less per participant. The participants and all data collected will remain completely confidential.

To participate, please contact me to schedule an interview at paferrin@liberty.edu.

A consent document will be available for you to complete at the time of the interview.

Sincerely,

Patricia Ferrin
Ed.S

Dear Principal:

As a graduate student in the School of Education at Liberty University, I am conducting research to better understand the implementation or lack of implementation of inquiry-based science instruction in the Christian middle school science classrooms. I am writing to invite you to participate in my study.

As the administrator of a Christian middle school, and if you are willing to participate, you will be asked to participate in an interview. The interview should take about 60 minutes or less. Your identity and all data collected from you will remain completely confidential.

To participate, please contact me to schedule an interview at paferrin@liberty.edu.

A consent document will be available for you to complete at the time of the interview.

Sincerely,

Patricia Ferrin
Ed.S

CONSENT FORM
A QUALITATIVE PHENOMENOLOGY OF CHRISTIAN MIDDLE SCHOOL IMPLEMENTATION OF INQUIRY-BASED SCIENCE INSTRUCTION

Patricia Ann Ferrin
Liberty University
Department of Education

You are invited to be in a research study of Inquiry Based Instruction (IBI). You were selected as a possible participant because you are a teacher of an ACSI Christian middle school. I ask that you read this form and ask any questions you may have before agreeing to be in the study.
Patricia Ferrin, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information:

The purpose of this study is to explore curriculum coordinators, teachers, and principals' implementation of Inquiry-Based Instruction (IBI) in Christian middle school science classes.

Procedures:

If you agree to be in this study, I would ask you to do the following things:
1.) Participate in a 30-60 minute interview and follow up. One-on-one interviews will be audio taped to ensure verbatim transcriptions. Follow up interviews are necessary to establish credibility for the participant's narrative. Transcriptions will be included and each participant will be allowed to read their responses and field notes for accuracy.
2.) Teachers or principals will provide lesson plans with goals and objectives from semester one for each grade.
3.) Allow up to three 50-minute classroom observations for each middle school science class.

Risks and Benefits of being in the Study:

The risks for this study are no more than the participant would encounter in everyday life.
There are no direct benefits to participating in this study.

Compensation:

You will not receive any compensation for taking part in this study.

Confidentiality:

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records and recordings will be stored securely and password protected, and only the researcher will have access to the hard copies, which will be kept in a locked cabinet. All data collected is strictly confidential, and pseudonyms will be assigned to all participants. The Liberty University Institutional Review Board has approved this document for use from 1/13/2017 to 1/12/2018 Protocol # 2703.011317

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time.
How to Withdraw from the Study:
If you choose to withdraw from the study, please contact the researcher at the email address below. Should you choose to withdraw, data collected from you will be destroyed immediately and will not be included in this study.
Contacts and Questions:
The researcher conducting this study is Patricia Ferrin. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at paferrin@liberty.edu. You may also contact the research's faculty advisor, Dr. Steve McDonald, at samcdonald2@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, Green Hall 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.
Please notify the researcher if you would like a copy of this information to keep for your records.
Statement of Consent:
I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.
(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)
The researcher has my permission to audio-record me as part of my participation in this study.
Signature: _____ Date: _____
Signature of Investigator: _____ Date: _____ The Liberty University Institutional Review Board has approved this document for use from 1/13/2017 to 1/12/2018 Protocol # 2703.011317

On May 16, 2015, at 11:42 AM, "Ferrin, Patty (School of Education)" <paferrin@liberty.edu> wrote:

Dr.

Will you grant permission for me to use the SMOP tool for my observations in middle school science classrooms?
My number is 434 609 1032 if you have time to call. My dissertation will be on IBI in the Christian middle school classrooms.

Blessings,

Mrs. Patty Ferrin EdS
6th Grade Language Arts, Liberty Christian Academy

LIBERTY CHRISTIAN ACADEMY (1967-2015) …EDUCATING FOR ETERNITY!
<image001.png>

Sun 5/17/2015 5:04 PM

Sure. Good luck with you dissertation.

V

Sent from my iPhone

May 6, 2018

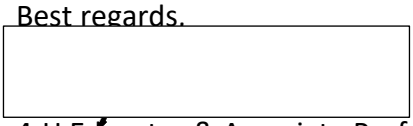
Patty Ferrin (& Ph.D.)
Liberty University
1971 University Blvd.
School of Education
DeMoss Hall 1165 AJ
Lynchburg, VA 24515

Dear Ms. Ferrin,

I am pleased to grant you permission to use my original instrument, the Beliefs About the Learning Environment (aka BALE) related to your research toward earning a Ph.D. I know that working full time and doing graduate studies at the same time is a time consuming task; hence, there is no implied timeframe on how long you may use the BALE.

Please share progress with your work and any improvements made to the instrument as convenient. Best wishes for success.

Best regards.



4-H Educator & Associate Professor of Extension
WSU Spokane County Extension

Appendix D

Teacher Interview Protocol

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Questions:

1. What is your understanding and definition of inquiry based instruction?
2. How would you explain the difference, if any, between IBI and project based learning?
3. Please share your experience/s with IBI in your classroom.
4. What has been or has not been your role in implementing IBI into your classroom?
5. What has been or has not been the impact on your student's performance since you have or have not implemented IBI?
6. What has been or has not been the impact on your student's motivation to learn since you have or have not implemented IBI?
7. What hindrances, if any, have you perceived that may or may not prevent you from implementing IBI?
8. To whom should you talk to find out more about implementing IBI in your classroom?
9. What are your beliefs about teaching from a textbook?
10. If teachers are responsible for the activities and methods they choose to teach standards, and students typically test higher in reasoning skills as a result of learning through inquiry, then

what are your plans for implementing IBI in your Christian middle school science classroom? If you do not plan on implementing IBI, why not?

11. What situations or training have influenced the implementation of IBI?
12. Is there anything else you would like to communicate about IBI in the classroom?