Spring 5-2017

ACADEMIC ACHIEVEMENT OF 6TH GRADE STUDENTS IN A SOCIAL STUDIES CLASSROOM IMPLEMENTING TRADITIONAL VS PROJECT-BASED LEARNING

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By

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A doctoral dissertation submitted to the
College of Education
in partial fulfillment of the requirements
for the degree Doctor of Education
in Organizational Leadership

Southeastern University
May, 2017

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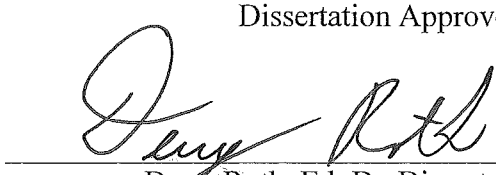

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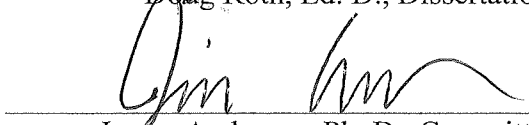

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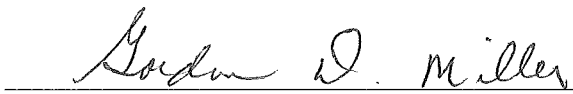

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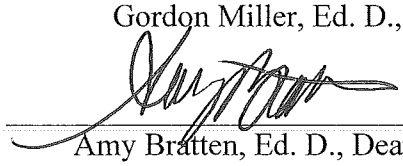

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DEDICATION

I would like to dedicate this project to my family. My wife, Jennifer, encouraged me to begin this journey and supported and encouraged me through the entire process. She spent countless hours taking care of our children and home, giving me the time and freedom to research and write my dissertation. My children, Derek, Olivia, Reese, Jackson, Ellie, Ainsley, and Piper encouraged me to get my degree, never complaining about my time spent researching and writing.

I am also thankful for my colleagues Dr. Mike Sligh, Wayne Shimko, and Darren Copeland for encouraging me through this process, asking me for updates on my progress, and always sharing words of support when needed.

ACKNOWLEDGMENTS

I would like to thank my committee, Dr. Doug Roth, Dr. James Anderson, and Dr. Gordon Miller, for their support and critique throughout this dissertation. Each of you shared your expertise and encouraged me along the way. The time I spent meeting and talking with each of you was invaluable. Your calmness throughout this journey was infectious and helped me realize that I could push through and complete this paper.

This study could not have been completed without the work of the classroom teacher, Kala Walls. Her desire to try something new and work with me on this project made it possible. I appreciate her patience with me and her flexibility with changes throughout the study.

ABSTRACT

This study compared students taught with traditional teaching methods and those with project-based learning methods in a sixth-grade social studies classroom. Student assessments were examined to determine how students scored on lower-level thinking questions and higher-lever thinking questions as defined by Bloom's taxonomy of learning. Results indicated that students who were taught through traditional methods scored significantly higher on lower-level thinking questions than those taught through project-based learning. Conversely, students taught through project-based learning scored significantly higher on higher-level thinking questions than those taught through traditional methods.

Key Words: project-based learning; traditional learning; inquiry-based learning; middle school social studies; instructional strategies

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I. INTRODUCTION

Introduction and background

For over one hundred years the established educational system in the United States has been predominantly teacher-centric (Gutek, 2011). This philosophy upholds the teacher as the content expert and primarily responsible for dispensing knowledge to the student. Attempts have been made through the years to change to a more student-centered approach, but these attempts have been short-lived or only affected local schools or individual classrooms (Tyack, 1974; Cuban, 1990). Project-based learning is an example of a student-centered approach that has been shown to be effective in some situations (Gultekin, 2005; Condliffe, Visher, Bangser, Drohojowska, & Saco, 2016; Thomas, 2000), yet many of these results have come from schools that have implemented project-based learning school-wide or for an extended period of time. There is conflicting data as to the effectiveness of project-based learning. Kirschner, Sweller, & Clark (2006) found that instructional practices with minimal guidance, such as project-based learning, are not effective. Conversely, Wirkala & Kuhn (2011) found that students have superior mastery when teaching conditions are student-centered as compared to lecture. Dobbs (2008) compared traditional teaching methods with problem-based learning and found that there was no significant difference in student achievement. Despite this mixed data, many educators are moving forward with project-based learning (Savery, 2006). This is due in part to the promise of more engagement for the students, resulting from higher student involvement in decision-making related to learning. Additionally, there is alignment between the 21st century

learning skills ("Framework for 21st Century Learning," n.d.) as well as more recent research connecting neuroscience and learning (Sousa, 2011).

Test scores for students in America have remained stagnant in recent years, and American students continue to lag behind the rest of the world (the United States ranks 35th in math and 27th in science) according to the Pew Research Center (Desilver, 2015). Education leaders are striving to determine what can be done to reverse these trends. A common complaint expressed by students is a lack of awareness of the applicability of the course content to their lives. One question educators often hear is, "When am I going to use this again?" The prevalence of the apathy in students and the lack of engagement in the learning process has renewed an interest in educators toward project-based learning. Project-based learning is an attempt to use real-world problems to engage the students in the learning process and help them to see the relevance of what they are learning by connecting the problem to the world outside the classroom (David, 2008; "What is project-based learning?", 2016). Educators also believe that project-based learning will help students to think deeper about problems, fostering more critical thinking and problem-solving skills associated with higher level thinking (Beckett, 2002; Mitchell, Foulger, Wetzel, & Rathkey, 2009).

The historical success of one type of education compared to another is not the central issue in this study. The reality is that traditional education practices have been the predominant form of education in the United States since the 1800s, and through the years there have been numerous efforts to change the instructional practices with varied success (Tyack & Cuban, 1995; Tyack & Tobin, 1994). Because of the recent interest in project-based learning, it is incumbent upon educators to examine whether this is a viable alternative to traditional education

or whether components of project-based learning would be beneficial as a supplement to traditional education.

Research gap

There is no shortage of research on project-based learning, but the research is scattered throughout disciplines and age levels. Much of the early research on project-based learning was conducted in the medical field (Strobel & Van Barnveld, 2009) and then moved naturally into the sciences. Strobel and Van Barneveld (2009) suggest that more research is needed beyond the medical field and specifically in other contexts such as K-12 education. Thomas (2000) conducted a review of research literature on project-based learning and concluded that there was limited research outside of the sciences. David (2008) suggests that more research focusing on the results of project-based learning is needed. This supports the assertion by Savery (2006) that there is a need for more empirical evidence as to the effectiveness of project-based learning. There is a widespread call in the literature for more research comparing project-based learning to other methods of instruction to determine effectiveness and whether one method is superior over another (Condliffe et al., 2016; Thomas, 2000; Bas & Beyhan, 2010; Sanson-Fisher & Lynagh, 2005; Frame et al., 2015). Questions remain as to whether younger students can respond to high level tasks and possess the skills necessary for successful implementation of project-based learning (Blumenfeld et al., 1991). Additionally, researchers have found conflicting results as to the effectiveness of project-based learning (Kirschner et al., 2006; Wirkala & Kuhn, 2011).

Purpose statement

The purpose of this study was to determine whether traditional or project-based learning results in higher academic achievement of students in a 6th grade social studies classroom. This

research was designed to fill in some of the gaps of comparison studies (traditional vs. project-based learning), expanded disciplines (social studies), and broader age groups (sixth grade).

Research questions

The dependent variable in this research was the academic achievement of the students. The independent variables were the methods of instruction (traditional and project-based learning). Two research questions were considered. Each question on the post-unit assessment measuring academic achievement was coded by the researcher as higher-level or lower-level as determined by Bloom's Taxonomy. Lower-level questions are ones in which the students are required to remember, understand, or apply information. Higher-level questions are ones in which students are required to analyze, evaluate, or create.

1. Do students score higher on questions involving lower-level skills on Bloom's taxonomy when taught with project-based learning vs. traditional learning?
2. Do students score higher on questions involving higher-level skills on Bloom's taxonomy when taught with project-based learning vs. traditional learning?

Hypotheses

H_1- Students instructed by means of project-based learning will score lower on questions requiring lower-level skills on Bloom's Taxonomy.

H_2- Students instructed by means of project-based learning will score higher on questions requiring higher-level skills on Bloom's Taxonomy.

Definition of terms

There is no universally accepted definition of project-based learning. When the following terms are used in this report, these are the definitions to which they refer.

Traditional teaching- Traditional teaching is a teacher-centered method of instruction in which the teacher's role is primarily to dispense information to students through a variety of means such as lecture, note-taking, discussion, pen-and paper assignments, and practice problems. The textbook often serves as the main resource and dictates the knowledge and skills to be learned (Diffily, 2002; Dobbs, 2008).

Project-based learning- Project-based learning is a student-centered approach in which students complete projects that are based on challenging, real-world, authentic questions or problems. Students must be involved in the design of the project as well as the decision-making throughout the project. The project culminates in an authentic product which reflects the learning. The learning takes place through the completion of the project, and the teacher's main role is that of facilitator (Thomas, 2000).

Problem-based learning- Problem-based learning is a subset of project-based learning. This method is student-centered and inquiry-based. Students must solve an ill-structured problem or dilemma in a logical and organized way. The problem is the central motivation for student acquisition of skills and knowledge (Larmer, 2014; Dobbs, 2008; Harris, 2014).

II. REVIEW OF LITERATURE

History of traditional learning

The modern American education system can trace its roots back to the heart of the industrial revolution (1820-1870). The American industrial revolution transformed America from a primarily agrarian and rural society to an urban one, heavily dependent on manufacturing and industry (Gutek, 2011). The changes taking place in the nation brought about a change in education. Prior to this time education was primarily for the social elite and wealthy and was not available for the common child (Galvin, 2003). There was great variation in the methods of education. With the influx of immigrants in the mid to late 1800s, the country saw a need to Americanize the children (Galvin, 2003), and many felt that education was the way this could most successfully be accomplished. The greatest challenge to this was that most students either did not attend school or attended seldom due to their work on family farms. In addition, approximately fifty percent of children ages five to nineteen attended school (National Center for Education Statistics [NCES], 1993). Many schools were taught by poorly trained individuals, relying primarily on textbooks for instruction and recitation to assess student progress (Reese, 2013). There was little uniformity in curriculum and practice, leading to huge variances in student knowledge from school to school. As early as the 1850s people complained of dull pedagogy and boring classrooms, and reformers began to call for a change to more professional teaching (Reese, 2013). The main concern was not that students were not learning, but that there was inconsistency throughout schools with little accountability (Reese, 2013).

This is not an indictment on the product of schools in the 1800s. Some would argue that students who attended school at this time had better ability to read, think, and discuss issues than students today (Wallbuilders, n.d.). The focus of reform was to increase the availability of schooling beyond the wealthy and social elite while adding consistency and accountability to help ensure that students from city to city and state to state would be afforded the same level of education (Gutek, 2011).

At the heart of those in favor of change in schooling was Horace Mann. Mann is often credited as the leader of the common school movement in which school became compulsory for all children, and unified standards for teachers and curriculum were introduced (Gutek, 2011). He was a strong advocate of free public education for all children, known as the Common School, and he was instrumental in starting the Normal School, designed to train teachers and bring credibility to the profession. Mann worked tirelessly to transform education by increasing funding for schools and pushing for reform throughout education. Industrialized America called for a student who was educated in all facets of society with the ability to read and write, and colleges wanted standardized curriculum and preparation for college (Tyack & Cuban, 1995).

The "Grammar" of schooling is described by Tyack and Tobin (1994) as the regular structures that organize the work of instruction. Many of the grammars of schooling that exist today were introduced during the Industrial Revolution. Examples of the grammar of schooling introduced at that time are separation of domains and splintering knowledge into subjects, awarding grades and credits as evidence of learning, dividing students by age, and classifying students and allocating them to classrooms (Markham, 2011; Tyack & Tobin, 1994; Tyack & Cuban, 1995).

By the end of the Industrial Revolution, in the early twentieth century, the foundation of the current American education system was firmly in place. While many education reforms have been attempted through the years, and change has taken place, the standard grammar of schooling has largely endured over time, and the changes have remained peripheral (Tyack & Cuban, 1995).

What is traditional learning?

Traditional learning is a teacher-centered, textbook-driven approach to education in which the teacher is the dispenser of knowledge, and the main priority is to inculcate minds with information (Markham, 2011; Diffily, 2002; Tyack & Tobin, 1994; Sungur & Tekkaya, 2006). A teacher-centered approach means that the teacher is expected to monitor and control students, assign tasks, and ensure they have accomplished the work. The teacher is expected to be the content expert and the information source (Ladewski, Krajcik, & Harvey, 1994) as well as the driver of all that happens in the classroom. Lessons are presented in a clear, organized fashion, and whether a student learns information is a result of the quality of the lesson as well as the student's ability, prior knowledge, and motivation to learn (Ladewski et al., 1994). A high priority in traditional learning is to cover the curriculum because of local or state requirements and high-stakes standardized testing. "High-stakes standardized testing tends to support instructional approaches that teach to the test. These approaches focus primarily on memorization through drill and practice, and rehearsal using practice tests" (Savery, 2006, p. 18). Any activity which will allow a teacher to help students perform well on the test is quickly integrated into the teaching. The type of activities or learning experiences one would expect to encounter in a traditional classroom are memorization of facts, textbook reading and note-taking, teacher lecture, and a cursory coverage of curriculum that is textbook driven (Dobbs, 2008;

Diffily, 2002). Students often spend considerable time completing worksheets and answering questions from a textbook based on the reading of the text. Learning tends to be descriptive, where students are looking for the correct answer or uncovering truths (Ladewski et al., 1994). There is more of a focus on low-level facts (Blumenfeld et al., 1991) instead of deeper thinking requiring higher-level skills. Hands-on activities are not uncommon, but they tend to be enhancements to make a unit fun, illustrate concepts, or demonstrate learning. They are rarely an integral part of the curriculum. Technology is currently leveraged to accomplish some of these tasks. For example, students can take notes on a tablet or laptop during class, and worksheets can be completed digitally and submitted for grading electronically. These examples of activities have not fundamentally changed the teaching or learning process; they have simply made certain tasks more efficient or allowed them to be completed in a different way. Learning in a traditional classroom tends to be individual, and students are passive learners as consumers of knowledge (Wagner, 2016a).

History and foundations of project-based learning

Project-based learning is rooted in a constructivist theory of education and dates back to William Kilpatrick and John Dewey in the late 1800s and early 1900s (Barron et al., 1998; Krajcik, Bleumenfeld, Marx, & Soloway, 1994; Frank, Lavy, & Elata, 2003; Beckett, 2002; Blumenfeld et al., 1991; Hmelo-Silver, 2004). Dewey and Kilpatrick were colleagues, and each man's work complemented the others. Kilpatrick's best-known work was titled *The Project Method*, and he said that students learn best when "wholeheartedness of purpose is present" (Barron et al., 1998, p. 272). The development of this form of education was a backlash against the rigid, teacher-centered approach that emerged as a result of the Industrial Revolution. Kilpatrick favored a child-centered approach in which social development took precedence over

cognitive development, emphasizing learning *to* think over learning *what* to think (Dr. Darrin, 2015). He also favored an integrated curriculum that was not compartmentalized.

John Dewey was the more well-known reformer and is most often credited as the founder of project-based learning and a proponent of progressive education. Dewey outlined his educational philosophy, and the following were some of his key beliefs which form the foundation for project-based learning (Dewey, 1897).

1. Activity is necessary for learning and must be for meaning, intentional, and not haphazard. In order to leverage the activity, it must coincide with the interests of the student or friction and disintegration of the child's nature will result (p. 1).
2. The teacher is responsible to tap into the child's instinct and shown desires so that school can represent life outside of the school. The teacher is responsible not to impose certain ideas or habits in the child, but, instead, must select the influences which will affect the child (p. 4).
3. The center of learning for the child is activity and not subjects. Learning must be active and not passive. When students are in passive learning mode, they only absorb information, which goes against the natural law (p. 7).
4. Abruptly introducing the child to studies such as reading, writing, and geography at a pre-determined time is a violation of the child's nature and can be detrimental to the long-term educational success of the child. (p. 5).

The ideas of Kilpatrick and Dewey did not transform education and take hold widespread, although student-centered reforms based on their work have continued to arise ever since their time. Through the years, reforms have been presented which alternate between student-centered pedagogy and teacher-centered instruction (Tyack & Cuban, 1995). Each time

a reform fails and is forgotten, it later returns in slightly varied form, depending on the context and conditions that persist at that time (Cuban, 1990). Reformers have promoted project-based learning many times throughout the years, and each time the project approach varies slightly from previous reform efforts. While elements of today's project-based learning are similar to that of Kilpatrick and Dewey, there are variances.

In the early twentieth century, the American progressive education movement began to promote and emphasize learning by doing (Reese, 2013). The centerpiece of learning by doing was the project. While projects were not a new aspect of education, the progressives desired to replace the understanding of the value of projects and the way they were used, moving to a more constructivist activity with a purpose in line with the project method (Knoll, 1997). While this progressive form of education became accepted in Europe, it did not gain wide acceptance in America.

In the 1920s there was an attempt to unseat the grammar of education. This reform was called the Dalton Plan (Tyack & Tobin, 1994; Tyack & Cuban, 1995). The Dalton Plan aimed to revolutionize teaching by eliminating self-contained classrooms, timed class periods, and promotions and retentions based on the current grading system. Students were free to interact with other adults and teachers, budgeting their time while accomplishing designed tasks. Students advanced at their own pace through various subject matter. While excitement grew for a period of time, and many schools adopted parts of the Dalton Plan, within twenty years no remnants of the Dalton Plan could be found. The 1930s brought about a plan called the Eight-Year Study in which educators all over the country began to infuse interdisciplinary studies in schools by combining subjects such as American History and Literature (Tyack & Cuban, 1995; Tyack & Tobin, 1994). Again, this experiment was short-lived, and, after the initial attempt to

change education, few remnants of the Eight-Year Study could be found. In the 1960s there was an attempt to challenge the Carnegie Unit as the standard for receiving credit in high schools. Many schools in Oregon moved to flexible scheduling and changed facilities to adapt to this new way of schooling. By 1970 most of the schools had reverted back to their original way of schooling and over the next decade the rest of the schools followed (Tyack & Cuban, 1995).

Each of these reform attempts carried elements of student-centered or progressive education and attempted to break through the established grammar of schooling. Each of these attempts failed. By 1980 it was reported that 90% of all students in public education remained in schools which were mainly teacher and textbook-driven, and the dominant tendency was toward various forms of teacher-centered instruction (Reese, 2013). Despite the continued failed attempts at reforming education and the inability of student-centered education to survive in any significant way, there is a recent resurgence of interest in student-centered education and, specifically, project-based learning (Markham, 2011; Allison et al., 2015; Harris, 2014; Beckett, 2002; Mitchell et al., 2009). There does not appear to be a single reason for the resurgence of interest in project-based learning. When one examines the cycle of reform (Cuban, 1990), it is not surprising that student-centered reform is of interest again. Growing concern over American students' test scores compared to the rest of the world is often impetus for change. With the advancement of the digital age and the use of the internet and social media, people around the world have the ability to connect and share ideas as never before. Well-known Harvard education professor, Tony Wagner, has partnered with High Tech High in California to produce a documentary on how this school uses project-based learning. This documentary has been shown countless times all around the United States and piqued interest in educators as to the benefits of project-based learning (Wagner, 2016b).

Inquiry-based learning

Inquiry-based learning is a foundational component of project-based learning in which education begins with the curiosity of the learner (Savery, 2006; Barron et al., 1998) and includes any type of learning in which students' interest has been aroused, causing them to be involved in the learning. Some examples of student involvement in learning are students finding solutions to problems, students finding answers or explanations to authentic problems, or students making decisions on learning connected to a researched subject (Frank et al., 2003). Students are not simply absorbing or presenting established facts. Inquiry-based learning emphasizes that learners are actively constructing knowledge in collaborative groups (Hmelo-Silver, 2004) rather than simply acquiring it. The leader in an inquiry-based educational setting is often called a tutor and is responsible for both facilitating the learning as well as providing knowledge (Savery, 2006). The tutor supports the learning process but does not provide information related to the problem. Instead, the tutor helps the learner to ensure that the thinking is clear and that the learner has the skills necessary to continue his endeavor to solve the problem.

While there are many examples and forms of inquiry-based learning, for the purpose of this research, there is only a need to focus on project-based learning and problem-based learning. These two types of learning are often confused, and many people use the names interchangeably, but there are some distinctions between them. Problem-based learning is a more specific and focused form of project-based learning (Condliffe et al., 2016; Larmer, 2014). Both methods promote an action-oriented model of learning designed to engage students in learning to promote complex and critical thinking (Lee, Blackwell, Drake, & Moran, 2014) through group work in which an authentic or real-world problem must be solved (David, 2008). Two key components

of both methods are that they are active and self-directed (Frame et al., 2015). Montessori education is an example of inquiry-based education that is built on constructivist theory, but it is outside the scope of this research as many of the core components of Montessori education do not align with project-based learning. The specific components that do not align are as follows: mixed age classrooms, activity from within a prescribed range of options, uninterrupted blocks of work time (ideally three hours or more), and specialized educational materials ("Core components of Montessori education," n.d.).

Problem-based learning is more focused to teach discipline-specific content and tends to align with standards, but it can also be used in multiple disciplines (Savery, 2006; Harris, 2014). The medical field uses problem-based learning extensively around the world (Sanson-Fisher & Lynagh, 2005; Ertmer & Simons, 2005; Strobel & Van Barnveld, 2009). Problem-based learning often works to find a solution to a problem that has already been identified using a team approach (Harris, 2014). The students are attempting to find the solution to a problem that has already been solved. They are not necessarily coming up with a new solution, but they are intent on uncovering solutions that they did not know existed. The end result of problem-based learning is a presentation of the solution to the problem. Problem-based learning can be used to work toward solving a specific part of a larger project.

Harris (2014) identified the following areas of difference between project and problem-based learning. Project-based learning is more open-ended and involves more input from the learner in constructing the project to answer the driving question. Learners even help to identify the driving question. Project-based learning is more likely to use an interdisciplinary approach and be more skill-focused resulting in a presentation that answers the driving question. The skills are as important as the content. Both methods involve a problem that must be solved, but

project-based learning turns the problem into a question. The following examples will help to illustrate the difference between the two methods.

Project-based learning- A teacher tells the students they will be studying the United States Presidential election. A group of students wants to find a better way to ensure that every vote is counted. This is project-based learning as the students came up with the driving question of "How can we find a better way to ensure that every vote is counted?" This is a real-world problem, and they can present their findings to someone in the community such as a local elections supervisor. There is no one solution to the question they have identified, and they will possibly come up with alternative solutions. Students will likely use math and language arts skills as they attempt to answer the question.

Problem-based learning- A teacher tells the students they will be studying the United States presidential election. The teacher tells the class that there is media bias that may influence the election. The students are going to investigate the effects of media bias on elections. This is problem-based learning because the teacher determined the project the students would investigate. The students will be learning through the problem, but many of the issues related to media bias are already known. Students will be learning about something that has already been established. Students may still be engaged and will examine a problem that is real-world and needs investigation. They can present their findings to local media at the conclusion of the unit.

What is project-based learning?

Definition. There is no current consensus on a definition for project-based learning (Marwan, 2015; Condliffe et al., 2016; Harris, 2014), but Thomas (2000) has identified several defining features of project-based learning based on his review of literature on this topic. This

remains broad because the present work on project-based learning is still evolving, and many classroom projects can contain various features of project-based learning.

According to Thomas (2000),

> Projects are complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations. Other defining features found in the literature include authentic content, authentic assessment, teacher facilitation but not direction, explicit educational goals, cooperative learning, reflection, and incorporation of adult skills (p.1).

As stated earlier, project-based learning was built on constructivist theory of education in which students construct their own understanding and knowledge of a specific topic through experiencing things and reflecting on those experiences (Marx et al., 1994). Constructivist theory was built on the ideas of early education reformers such as William Kilpatrick and John Dewey (Blumenfeld et al., 1991; Hmelo-Silver, 2004). Constructivist theory was also influenced by Jean Piaget's cognitive theory of development in which students learn through developmental stages with diminished concern on the specific content of the learning (McLeod, 2009; Harris, 2014). Common phrases often used in conjunction with project-based learning are "learning by doing" and "hands-on learning", but project-based learning is substantially more than that (Harris, 2014; Condliffe et al., 2016; Marx et al., 1994).

Real-world problems. Project-based learning is about solving real-world problems (Diffily, 2002; David, 2008) that are complex and ill-structured (Krajcik et al., 1994) encompassing authentic, discipline-based content (Ertmer & Simons, 2005). In addition to

solving a problem, the projects can investigate a phenomenon, design a model or help students to make a decision (David, 2008). The use of a real-world problem connects the learning to real life and is designed to foster increased engagement and motivation. This also allows students to see meaning in what they are learning, answering a question often asked by students, "Why do I have to learn this?" In many cases a driving question is used to direct the learning toward solving the problem (Barron et al., 1998). The genesis of the project is inquiry, and the driving question must be based on inquiry (Bell, 2010; Barron et al., 1998). Developing the driving, or essential, question is an important part of the development of the project, and in a student-centered learning environment, it is important for the students to be part of this process (Ladewski et al., 1994). Krajcik et al. (1998) worked with middle school teachers on developing driving questions and have concluded that they must be feasible, worthwhile, contextualized, and meaningful. Absent of these elements, the questions run the risk of losing engagement of the students. The projects must be student-directed and conducted over a period of time, weeks, and not days, thus allowing the students to be decision makers in the process (Diffily, 2002).

Authentic is a term that is often used to describe the type of problems and questions that students will be solving. Authentic refers to learning that is not contrived by the teacher with specific content objectives. The following are elements of authentic learning (Fredricks, 2016):

1. Open-ended problems with unpredictable solutions
2. Fewer topics covered in a more systematic way
3. Real-world problems
4. Substantive conversations with peers
5. Artifacts developed that are shared with larger group

Student-centered learning. Student-centered education is at the heart of project-based learning and places students in the middle of learning (Koparan & Guven, 2014). Student-centered practices allow students to make sense of the world while constructing knowledge (Hodges, 2010), concentrate on students' use of disciplinary concepts (Lee et al., 2014), empower learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a problem (Savery, 2006). Jennifer Fredricks (2016) has identified the following five key characteristics of a student-centered classroom:

1. Focus on both teacher and student
2. Teacher plays facilitative role
3. Students need to take greater responsibility for their learning
4. Students encouraged to collaborate with peers
5. Classroom is noisy and often busy

Students must move from passive learners to active participants in the learning (Zuniga & Cooper, 2016) as they take ownership in their learning, become decision-makers, and work collaboratively in groups. While students work collaboratively to solve problems, the teacher, as facilitator, is an important part of the collaborative process as well (Harris, 2014).

The project. The key element of project-based learning is the project itself. A proper understanding of the essential elements and purpose of a project is critical for developing a successful project. Projects are not new and date back to the 17th and 18th centuries when they were introduced so that students could work independently, combining theory and practice (Knoll, 1997). The project model developed in the 19th century involved a student learning skills and knowledge followed by independently and creatively applying this to a practical project (Knoll, 1997). Another version of this project method moved the project to the center of the

teaching. This made the project the basis of the curriculum and not a supplementary add-on or peripheral to learning (Bell, 2010; Harris, 2014). Projects in the traditional classroom are often used at the culmination of teaching units, allowing a student to show what they have learned or as an add-on activity that is considered fun. The project is often graded on the "doing" of the project as opposed to learning. Project-based learning and doing projects are not synonymous (Markham, 2011).

The fundamental premise of project-based learning is that the project is the core of curriculum and learning; therefore, the design of the project is critically important. The project is designed around a real world, authentic question, and the purpose of the project is to foster learning in order to solve or address the problem in some way. In other words, the learning takes place through the project, and the project is the conduit for learning. The research of Marwan (2015) suggests that the learning experience of students will be more meaningful when they accomplish a project. Successful projects are not ones that represent learning that has already taken place or an artifact that is built as a replica of an element of learning such as building a pyramid when studying ancient Egypt or building a dwelling when studying Native Americans. While these endeavors are not harmful, they do not promote the project-based learning objectives or develop higher-order thinking skills and deeper understanding of the subject matter (Ertmer & Simons, 2005). Through the development of the project, students and teachers should begin to see the curriculum as a dynamic set of ideas to explore as opposed to a fixed set of ideas that must be transferred from teacher to student (Marx et al., 1994). This will result in a reduced focus on inert knowledge that does not lead to understanding or investigation, but rather simply leads to knowing (Marx et al., 1994). The project should lead students to make connections between the activities and the knowledge one hopes to foster (Barron et al., 1998).

Presentation. The culmination of a project should be the presentation of the solution of the problem to an individual and/or group outside of the school (Blumenfeld et al., 1991). The presentation may be an artifact or some other way to present a solution to the problem and can be made by an individual or a team. The presentation to individual(s) outside the school is designed to increase motivation and help students connect the learning to the real world. This presentation is also more than just showing what was learned. The presentation must encompass both the learning of the information that led to the solution as well as the solution itself. The process and skills used to devise a solution are just as important as the solution itself (Cerezo, 2004).

Training and support

Changes in education require training and administrative support of teachers endeavoring to make change. This section will discuss the nature of the training and support as applied to project-based learning. Even teachers with the best intentions need quality training and systematic support to successfully implement a novel teaching approach (Mitchell et al., 2009). The more novel the approach, the more training may be necessary. The curriculum must be developed and aligned with professional development and administrative support (Geier et al., 2008) with an understanding that a broad restructuring of professional development may be necessary (Solomon, 2003). Proper evaluation must be another key element of administrative support (Hodges, 2010). The nature of the evaluation must be constructive rather than punitive if it is to be helpful.

Teachers require training on what a project-based learning project really is and what it is not. In addition, training on the development of the real-world questions must drive the project. If teachers give assignments and activities they label as projects, but these projects are not rigorous, authentic projects, then the student learning will suffer (Larmer, Mergendoller, & Bass,

2015). These projects will then, most likely, backfire resulting in wasted time, frustration and a failure of both teacher and student to understand the possibilities of project-based learning (Larmer et al., 2015).

The teachers will be adjusting to a changing role and a shift in their thinking to participating in the learning context with children (Mitchell et al., 2009). This shift requires ongoing support from administration (Krajcik et al., 1994) and opportunity for teachers to collaborate on the most effective ways for this to take place. Feedback from teachers interviewed by Krajcik et al. (1994) also suggests that attention must be paid to the difficulties the teachers will face and ways to support them as they face the difficulties if adoption of project-based learning is to be successful. The three key elements of ongoing support for teachers are time, teamwork/collaboration, and reflection (Marx et al., 1994; Krajcik et al., 1994; Frank et al., 2003). Teachers appreciate collaboration with peers and the opportunity to have teacher-sharing times as a way to support learning. This allows teachers to learn from each other and affords them the opportunity to reflect on their experiences. Experience educates via reflection (Krajcik et al., 1994). The work of Frank et al. (2003) suggests that the teamwork/collaboration time should be an initiated process, requiring organizational activities and specific procedures over a period of time. Without the leading of administration or a lead teacher, this time could quickly disintegrate into a session of complaining with little accomplished. The structure encourages continued progress while allowing plenty of communication via the collaboration.

Obstacles to project-based learning

With change comes obstacles that hinder movement. How the obstacles are handled will play a large role as to whether the changes are successful. Researchers have identified many

obstacles that hinder movement from traditional learning to project-based learning. Some of the obstacles to consider are changing teacher role (Lee et al., 2014; Diffily, 2002; Savery, 2006; Marx et al., 1994; Ladewski et al., 1994), changing student role (Ertmer & Simons, 2005; Frank et al., 2003), additional time needed to complete project-based learning (Harris, 2014; Tyack & Tobin, 1994; Marx et al., 1994; Ladewski et al., 1994; Ertmer & Simons, 2005), and pressure to adhere to state and federal mandates (Harris, 2014; Marx et al., 1994). In some cases the obstacles have been addressed, and movement has been made. In other cases the obstacles have been too much to overcome.

It is imperative that teachers understand their roles in the classroom if they are going to be effective educators (Lee et al., 2014). The first obstacle for many teachers to overcome is the changing role of the teacher in project-based learning. Teachers must shift from a role of dispenser or provider of knowledge to that of a manager or facilitator of learning (Diffily, 2002; Savery, 2006). A more in-depth analysis of the literature related to those roles will be conducted in another section of the review, though the teacher's role for a majority of educators will change in a drastic way. The change from a teacher-directed approach employing predominantly lecture-style instruction to a student-centered approach creates tension and mental drain in the teacher (Marx et al., 1994) as this new approach conflicts with prior teaching methods and training (Ladewski et al., 1994). This is due, in large part, to the fact that this is the only way many teachers have ever known, both as a student and educator. This adaptation is difficult for many teachers and requires a drastic change in attitude about teaching roles, and many are not ready to make that change (Frank et al., 2003).

An often overlooked obstacle to project-based learning is the role of the student. Some students are resistant to move from passive learners to active learners (Ertmer & Simons, 2005).

The research of Frank et al. (2003) indicated the importance of training students in group work before a project begins to increase their comfort level and improve chances of success for the project. Some students have achieved perceived success in traditional learning so they are resistant to change. It is perceived success because the student may have high grades, but that does not indicate true learning has taken place. Evidence confirms that middle school students do not necessarily respond to high-level tasks with increased use of learning strategies, and students in general tend to resist tasks involving high-level cognitive processing (Blumenfeld et al., 1991). When dealing with elementary and middle school students, some have questioned the developmental readiness of the learner to use the skills necessary to accomplish the tasks required in project-based learning (Wirkala & Kuhn, 2011; Kirschner, Sweller & Clark, 2006).

An obstacle that has surfaced in several studies related to project-based learning is the problem of time (Harris, 2014; Tyack & Tobin, 1994; Marx et al., 1994; Ladewski et al., 1994; Ertmer & Simons, 2005). This refers to the amount of time needed in the classroom to accomplish the projects as well as the time required for preparation of the project. Preparation for the project is a concern because this is a new approach and requires additional time to develop each unit for the first time. The in-class time concern is related to time balancing the accomplishment of the task with other required tasks and goals.

There are many state and federal curriculum mandates that teachers must adhere to, and the switch to project-based learning is a major challenge to teachers as they feel pressure to adhere to the mandates of the standards (Harris, 2014; Marx et al., 1994). This obstacle will not change unless it is addressed by policy makers and administration who can alleviate these pressures (Solomon, 2003). Teachers feel a commitment to cover the curriculum, and if curriculum is not redesigned, curriculum coverage and project-based learning will conflict.

The design of the project is a concern for teachers, especially in the beginning stages of the development of project-based learning (Lee et al., 2014; Wirkala & Kuhn, 2011) as they work toward projects that are challenging and developmentally appropriate. Often the project guidelines lack specificity (Condliffe et al., 2016; Mitchell et al., 2009).

Schools must deal with the growing incompatibilities between progressive education and the current "grammar" of schooling, which includes things such as the college entrance requirements and metrics for admission, standardized testing, Carnegie Unit for high school credit, and the current schedule dividing learning throughout the school day by time and subject matter (Tyack & Tobin, 1994; Tyack & Cuban, 1995; Markham, 2011) as well as other teaching methods and organizational structures (Harris, 2014).

Teacher and student roles

Stronge and Tucker (as cited in Hutchings, 2010) asserted that teachers are the most important factor in schools, and Lee et al. (2014) said that teachers must understand their role in order to be effective in the classroom. A lack of understanding will lead to frustration (Lee et al., 2014). The roles of teachers and students are different in a project-based learning classroom than in a traditional classroom. The shift from a teacher-directed to a student-centered classroom is often slow (Sungur & Tekkaya, 2006). Fredericks (2016) laid out the basic differences between a teacher-directed and student-centered classroom. The information is found in Table 1.

Table 1

Teacher-directed vs Student-centered classroom

Teacher-directed	Student-centered
Teacher is in control	Focus is on both teacher and student
Primarily uses direct instruction	Teacher plays facilitative role
Students are passive recipients of knowledge	Students need to take greater responsibility for their learning
Students are quiet	Students encouraged to collaborate with peers
	Classroom is noisy and often busy

Fredericks, 2016

Teachers. The teachers move from the role of primary dispenser of knowledge and the transmitter of information to a facilitator who no longer is required to have all the answers (Diffily, 2002; David, 2008; Markham, 2011). Teachers must make the choice to relinquish some of the learning to the students (Boaler, 2002). The traditional teacher role relies on lecture, sequencing content, drill, and testing (Ntombela, 2015). These practices must also change with a move to project-based learning.

The role of a facilitator is often misunderstood as someone who simply sits back and allows the students to work on whatever they choose with little or no interaction with the students. Teachers are still in charge, but they use different strategies such as pondering, wondering aloud, and reflecting questions back to students (Diffily, 2002) while using less directing and more delegating (Dobbs, 2008). Blumenfeld et al. (1991) identified the key roles of the project-based learning teacher as follows:

1. Create opportunities for learning by providing access to information
2. Support learning by scaffolding instruction, modeling and guiding students to make tasks more manageable
3. Encourage students to use learning and metacognitive processes
4. Assess progress, diagnose problems, provide feedback, and evaluate overall results

Direct instruction will still be necessary at certain junctures in the process as teachers scaffold learning for the students to fill in where prior knowledge is missing (Wirkala & Kuhn, 2011). The shift requires the teachers to have more pedagogical content knowledge rather than knowledge of a particular subject (Hutchings, 2010). Teachers must also shift their thinking to embrace co-creating and participating in the learning context with children (Mitchell et al., 2009). The role of facilitator involves teaching children how to learn and construct their own knowledge, mediating (Frank et al., 2003), guiding and advising, offering resources (Solomon, 2003), locating information to address needs, monitoring and guiding progress, providing feedback (Ertmer & Simons, 2005), coaching using questioning strategies, and modeling good strategies for learning and thinking (Hmelo-Silver, 2004). The relationship between teacher and student has always been a critical factor in learning and the change in roles does not lessen the significance of this relationship (Allison et al., 2015). Project-based learning requires teachers to exhibit behaviors which support the autonomy of learners. Table 2 compares controlling teacher behaviors with teacher behaviors that support autonomy in learners.

Table 2

Comparison of teacher behaviors

Controlling	Autonomy Supportive
Keep possession of learning materials	Arrange active learning opportunities and materials
Work out solutions before students have time to work them out independently	Ask students what they want
Tell students the answer	Give students time to work in their own way
Use controlling language	Provide opportunities for students to talk
Use should/ought sentences	Be responsive to students' questions
Use praise as contingent reward	Praise improvement and mastery

Note. Fredericks, 2016

Students. The role of the student in a project-based learning environment will shift from a passive receiver of content to an active learner who must be involved in constructing his own knowledge (Sungur & Tekkaya, 2006; Diffily, 2002; Savery, 2006; Zuniga & Cooper, 2016). Students will need to initiate learning tasks, set goals, decide on appropriate strategies to achieve goals, and monitor and evaluate progress (Sungur & Tekkaya, 2006). Students will have more control of their own learning as they are actively involved in deciding the problem that will be solved or the phenomena to investigate (David, 2008; Diffily, 2002). Self-directed learning is a distinguishing feature of project-based learning (Hmelo-Silver, 2004). Students will also be required to conduct research, integrate theory and practice, and apply new knowledge and skills to develop solutions to the defined problem (Savery, 2006).

21st century learning skills

The Partnership for 21st Century Learning has identified critical thinking, creativity, collaboration, and communication as the key learning and innovation skills as part of its Framework for 21st Century Learning (n.d.). At one time, problem-solving was one of the 21st century learning skills, but has since been combined with critical thinking (Ntombela, 2015; "Critical thinking and problem solving," n.d.) and are considered joint skills. Harris (2014) found a correlation between project-based learning and 21st century learning skills, and Dochy, Segers, Van den Bossche and Gijbels (2003) found that there is a robust positive effect of project-based learning on performance skills. Condliffe et al. (2016) found that project-based learning can enhance problem-solving skills and a study by Bellanca and Brandt (as cited in Ntombela, 2015) suggested that 21st century learning skills could best be achieved by project-based learning. These findings agreed with Harris (2014) who found that project-based learning addressed the 21st century learning skills of communication, collaboration, creativity, innovation, critical thinking and problem solving.

Project-based learning emphasizes skill building through real-world challenge problems (Ntombela, 2015) so it is no surprise that there is a connection between 21st century skills and project-based learning. Collaboration provides opportunities for sharing and critiquing of ideas and plans (Krajcik et al., 1994), and project-based learning is inherently a collaborative process (Markham, 2011) with collaboration central to the learning process (Harris, 2014). Critical thinking is connected with project-based learning as it becomes more inherent in the educational process and less of a separate skill isolated from course content (Markham, 2011).

Students currently see education as disconnected from the world as the skills they are taught and use in the classroom are different from the skills that employers seek (Scott, 2005;

Richardson, 2016). Allison et al. (2015) found that project-based learning may contribute to employability, non-cognitive skills, and the 21st century skills employers are looking for.

Richardson (2015) said,

> Regardless of their educational path, students moving into adulthood today need more than anything else to be voracious, passionate learners, adept at creating their own personal learning curriculum, finding their own teachers to mentor and guide them in their efforts, and connecting with learners with whom they can collaborate and create (p. 26), and Papert (1998) said,
>
> The one really competitive skill is the skill of being able to learn…We need to produce people who know how to act when they're faced with situations for which they were not specifically prepared (p.10).

Gopnick (2016) found that four-year-olds were less likely to find their own solutions to making a complicated toy work when the experimenter taught them than when they were allowed to observe trial and error of others and think about the problem. In the twenty-first century, the world needs globally competent students who are engaged in the world (Mansilla, 2016). Project-based learning can be used to develop global thinkers as they are engaged in global projects that do more than acquire knowledge and skills (Mansilla, 2016).

Motivation and engagement in learning

Traditional education is teacher-centered and, therefore, is dependent on the teacher to provide the motivation for the student to learn prescribed curriculum. It is a challenge for educators to foster intrinsic motivation in students so that they will enjoy the learning process and be more engaged, resulting in deeper learning. Students often ask the question, "Why do I need to know this?" If teachers can provide better answers to this question, students will see the

relevance of education to life, and this will increase motivation (Lehmann, 2016). Project-based learning attempts to bring together the questions of motivation (*Why am I learning this*? and *When will I ever use this again*?) with questions of thinking and learning (*How can I solve this problem*? and *What do I need to know to solve this problem*?) instead of looking at these elements in isolation (Blumenfeld et al., 1991).

Project-based learning allows students to choose their own topics for projects, which increases meaning for children (Diffily, 2002), and the real-world nature of the problem creates interest in students (David, 2008). Student choice is a key element of this approach (Bell, 2010). Without input and an understanding of the goals of the project, students will lose interest and lack motivation (Frank et al., 2003). Several studies have found connections between project-based learning and motivation. The primary connection found by researchers is that project-based learning increases intrinsic student motivation for learning (Marwan, 2015; Coyne, Hollas, & Potter, 2016; Hodges, 2010; Holmes & Hwang, 2016; Catapano & Gray, 2015; Condliffe et al., 2016). The learning becomes inherently valuable because it is connected to something real (Solomon, 2003). When students feel that the topic or problem they are studying is worth learning more about, motivation is increased and the investigation is more in-depth (Bas & Beyhan, 2010). Hodges (2010) found that as students had more control in the learning process more meaningful learning occurred.

Tony Wagner (2016a) is a leader in the current movement toward student-centered learning through project-based learning, and he identified five contradictions taking place in traditional education that demotivate students to problem solve. The contradictions are identified in Table 3.

Table 3

Contradictions in traditional education

Traditional Education Demotivators
All about measuring and rewarding individual learning.
We are penalizing students for mistakes and errors.
Heavy reliance on extrinsic motivation and reward. Successful people tend to be intrinsically motivated as they are often working toward something they are passionate about and with a purpose.
Compartmentalize knowledge- Students see subjects as isolated knowledge with no interconnectedness.
Failure- The fear of failure leads to risk aversion. Innovation demands that students take risks.

Note. Wagner, 2016

Wagner suggests that project-based learning addresses each of these learning motivation contradictions. Fredericks (2016) provided a list of elements for motivationally rich tasks. This list aligns with essential elements of project-based learning, furthering the connection between project-based learning and motivation. The list is as follows:

Motivationally rich tasks…

1. are meaningful and personally relevant.
2. are adequately challenging.
3. have variety.
4. have opportunities for choice.
5. have clear expectations.
6. have opportunities to work in groups.

Engagement is a multidimensional construct involving behavior, emotion, and cognition (Fredricks, 2016). Researchers suggest that there is a link between student motivational

orientation and cognitive engagement in schoolwork (Blumenfeld et al., 1991). As Sousa (2011) studied the connection between brain research and education, he found that students were more likely to remember content in which they made an emotional investment. Engagement is more than compliance and on-task behavior. In fact, high-achieving students are not necessarily engaged according to Fredericks (2016). Fredericks (2016) also has found that engagement is a strong predictor of academic and non-academic outcomes such as dropping out of school. Wirkala and Kuhn (2011) have shown that students have better long-term retention and ability to apply new information if the instructional method engages them and allows them to put the ideas to use.

Engagement is linked to project-based learning in that constructivist learning cannot happen when students are passively absorbing knowledge imparted by the teacher (Frank et al., 2003; Condliffe et al., 2016). As students increase intrinsic motivation and take personal responsibility, their engagement increases (Marwan, 2015). Project-based learning also has been found to increase the enjoyment of students toward learning thus resulting in greater engagement (Bas & Beyhan, 2010; Sanson-Fisher & Lynagh, 2005; Ertmer & Simons, 2005). Activities which offer choice, challenge, and novelty stimulate student interest in learning, (Allison et al., 2015), and learning is increased through active participation (Dobbs, 2008).

Table 4 shows a comparison between traditional school tasks with out-of-school tasks one might use in a job setting. The traditional school tasks are non-engaging, less interesting, and dull. Sousa (2011) described these types of traditional tasks as disengaging.

Table 4

Comparison of traditional school and out-of-school tasks

Traditional school tasks	Out-of-school tasks
Passive	Active
Individual	Group work
Limited time	Extended time
Abstract	Real world problems
Reproduction of knowledge	Creation of knowledge
Share with the teacher	Share information publicly
Delayed feedback	Immediate feedback
Limited autonomy	Greater autonomy

Note. Fredericks, 2016

Teacher and student satisfaction

The response of teachers and students to project-based learning will be a determining factor in the long-term viability and efficacy of this approach to education. Students and teachers must see positive results or they will become discouraged and question whether this approach is worth the effort. Several studies have found that there is high satisfaction for project-based leaning from teachers and students.

Project-based learning made learning more enjoyable (Gultekin, 2005) and fostered more excitement in students about learning (Catapano & Gray, 2015). Students preferred learning practices that encouraged active learning (Hodges, 2010) and allowed students to participate in planning what they learned (Catapano & Gray, 2015). Students felt that learning was more meaningful through project-based learning (Kean & Kwe, 2014), and students perceived that it

improved their ability to think as well as the rate and level of learning (Frank et al., 2003). Some students also felt that a team approach to learning assisted with critical thinking, problem-solving, and test prep as compared to traditional learning (Frame et al., 2015). Students felt that project-based learning helped them to be more confident and take control of their own learning and allowed them to be more successful in understanding assignments (Cerezo, 2004). Students also reported increased organizational skills, which helped them in other classes (Cerezo, 2004), and they had a better perception of the overall learning environment (Schauber , Hecht, Nouns, Kuhlmey, & Dettmer, 2015). Teacher satisfaction rises when the teachers are involved in selecting activities and play a role in the curriculum development (Boaler, 2002), and they are more open to project-based learning over time as they are able to make changes and do more projects (Marx et al., 1994).

Conversely, some teachers and students expressed dissatisfaction with project-based learning. Teachers found that some students did not participate in the project; they became apathetic and withdrew (Hunaiti, Grimaldi, Goven, Mootanah, & Martin, 2010). Some teachers felt that while students were engaged and enjoyed their work, it was not always productive (Sanson-Fisher & Lynagh, 2005). High achieving students were threatened by a new approach to learning as they had been successful in the previous approach and saw no need to change (Dobbs, 2008). Other students were frustrated because they were used to direct instruction and simply wanted to be told what to do, and others got bored because they lacked some basic skills and did not get the help they wanted (Tyack & Tobin, 1994).

Bloom's Taxonomy

Bloom's Taxonomy is a model developed over sixty years ago as a way to aid teachers in formulating lessons designed to develop a wide range of thinking skills in the cognitive domain

(Bloom, Engelhart, Hurst, Hill, & Krathwohl, 1956). The model was designed to promote higher-order thinking skills and is hierarchal, as the further questions move up the model the more abstract and complex the thinking necessary to answer questions (Hess, Jones, Carlock, & Walkup, 2009; Sousa, 2011). In 2001 the taxonomy was revised to encompass both the cognitive processes and knowledge as well as adding verb forms to better fit the way they are used in learning objectives (Anderson et al., 2001). Table 5 reflects revised levels of Bloom's Taxonomy in order of complexity. The chart was developed by Hess et al. (2009) and contains revised process dimensions and terms as well. While there is still a hierarchy, the revised taxonomy loosens the hierarchy to allow levels to overlap (Sousa, 2011). The lower three levels of the taxonomy (remember, understand, apply) are consistent with a convergent thinking process, involving recall and application based on what is known (Sousa, 2011). The upper three levels (analyze, evaluate, create) are divergent thinking, which involves new insights and discoveries, not part of the individual's original knowledge (Sousa, 2011).

Table 5

Revised Bloom process dimensions

Revised Bloom Process Dimensions
Remember- retrieve knowledge from long-term memory, recognize, recall, locate, identify
Understand- construct meaning, clarify, paraphrase, represent, translate, illustrate, provide examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as examples from given), predict, match similar ideas, explain, compare/contrast, construct models
Apply- carry out or use a procedure in a given situation; carry out (apply to a familiar task) or use (apply) to an unfamiliar task
Analyze- break into constituent parts, determine how parts relate, differentiate between relevant and irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias or point of view)
Evaluate- judge based on criteria, check, detect inconsistencies or fallacies, judge, critique
Create- combine elements to form a coherent whole, reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce for a specific purpose

Note. Hess et al., 2009, p. 3.

The use of Bloom's Taxonomy to assess objectives and thinking skills is not dependent on the method of instruction. The taxonomy is used in teaching centers at universities such as Vanderbilt University and University of Central Florida (Armstrong, n.d.; "Bloom's Taxonomy," n.d.). As such, the universal nature of the framework allows it to be beneficial as a tool that can aid in the assessment of project-based learning.

Essential elements of project-based learning

It is possible to use elements of project-based learning and not have a project be considered true project-based learning. It has already been established that there is no consensus of definition for project-based learning (Marwan, 2015; Condliffe et al., 2016; Harris, 2014);

therefore, in the absence of a universally accepted definition, researchers set out to determine what essential elements should be present for learning to be identified as true project-based learning. Three major works prescribed these elements. Thomas (2000) reviewed the relevant research that had been completed on project-based learning in the ten years preceding his review. He indicated that his review "is inclusive rather than selective" (p. 1) in light of the fact that little research had been completed up to that time. Condliffe et al. (2016) recognized that the research on project-based learning has expanded since Thomas's work was completed; therefore, they focused their review on the work that was published since Thomas. The work of Condliffe et al. (2016), "…describes how project-based learning has been defined in the research literature and enacted in K-12 settings, assesses the project-based learning implementation and effectiveness research…" (p. 3). The Buck Institute for Education is an organization that exists to help prepare students for life by resourcing teachers and schools in the effective implementation of project-based learning for all grade levels. The senior fellow and editor in chief of the Buck Institute have developed a standard of essential project design elements (Larmer, Mergendoller, & Boss, 2015). They have established numerous partnerships around the world to develop and promote project-based learning. The partnerships include organizations such as the following: Big Picture Learning, ConnectEd, EdLeader21, EdVisions, Envision Schools, Expeditionary Learning Schools, The George Lucas Educational Foundation, High Tech High, National Academy Foundation and New Visions for Public Schools 9 (www.bie.org). Table 6 contains a side-by-side comparison of the essential elements of project-based learning as identified by Condliffe et al. (2016), Thomas (2000), and Larmer, Mergendoller & Boss (2015). No significant differences exist between the essential elements of the three works. Condliffe et al.

(2016) broke down the design into three major areas of curriculum, project, and assessment. While the specific wording varies, the overall design elements are aligned.

Table 6

Essential elements of project-based learning

Condliffe et al., 2016	Thomas, 2000	Larmer, Mergendoller, & Boss, 2015
Curriculum Design 1. Driving questions to motivate learning 2. Target significant learning goals 3. Use projects to promote learning 4. Dedicate sufficient time to PBL Project-based learning instructional approaches 1. Promote construction of knowledge 2. Cultivate student engagement 3. Use scaffolds to guide student leaning 4. Encourage student choice 5. Support collaborative learning Assessment Design Principles 1. Create a product that answers the driving question 2. Provide opportunities for student reflection and teacher feedback 3. Present products to authentic public audiences	*Centrality*- Project-based learning projects are central, not peripheral to the curriculum *Driving question*- project-based learning projects are focused on questions or problems that "drive" students to encounter (and struggle with) the central concepts and principles of a discipline. *Constructive investigations*- projects involve students in a constructive investigation *Autonomy*- projects are student-driven to some significant degree. *Realism*- projects are realistic, not school-like.	1. Challenging Problem or Question 2. Sustained Inquiry 3. Authenticity 4. Student Voice and Choice 5. Reflection 6. Critique and Revision 7. Public Product

Effectiveness of project-based learning

Research on the effectiveness of project-based learning is conflicting. Numerous studies have shown that project-based learning produces positive outcomes (Gultekin, 2005; Diffily, 2002; Boaler, 2002; Ladewski et al., 1994; Frank et al., 2003; Beckett, 2002; Mitchell et al., 2009; Marwan, 2015; Coyne, et al., 2016; Bas & Beyhan, 2010; Bell, 2010; Solomon, 2003; Frame et al., 2015; Blumenfeld et al., 1991; Geier et al., 2008; Thomas, 2000; Condliffe et al., 2016; Holmes & Hwang, 2016), but the nature of the outcomes varies greatly, and not all are cognitive-related. Additional research suggests that project-based learning is not effective, especially in the cognitive realm (Bas & Beyhan, 2010; Sanson-Fisher & Lynagh, 2005; Strobel & Van Barnveld, 2009; Kirschner et al., 2006; Dobbs, 2008; Wirkala & Kuhn, 2011; Dochy et al., 2003; Scott, 2005). Other research has found that project-based learning may result in cognitive gains, but the gains are not as great as those in traditional learning (Hodges, 2010; Holmes & Hwang, 2016; Kirschner et al., 2006). This conflicting research requires a closer examination of the specific nature of the findings in these studies.

Research has been conducted at all levels of K-12 learning (elementary, middle school, and high school) with the majority of research in the high school (Condliffe et al., 2016; Thomas, 2000). Much research exists in higher education, but this research is predominantly in the area of problem-based learning, which, as has been previously noted, is a more specific area of project-based learning. Problem-based learning began in the medical field and is widely found in the sciences, although problem-based learning research has expanded into other disciplines as well (Thomas, 2000; Ertmer & Simons, 2005; Sanson-Fisher & Lynagh, 2005; Strobel & Van Barnveld, 2009). Project-based learning research has been conducted in multiple subject areas

such as math, language arts, social sciences, science and foreign language, but more studies have been conducted in science and the social sciences in recent years (Condliffe et al., 2016).

Cognitive benefits. Numerous studies have found that students who have been taught through project-based learning retain information for a longer time than those taught traditionally (Diffily, 2002; Marx et al., 1994; Beckett, 2002; Strobel & Van Barnveld, 2009; Wirkala & Kuhn, 2011; Dochy et al., 2003). Dochy et al. take this a step further by suggesting that students have less knowledge when completing a unit of study, but they retain a higher amount of the knowledge they do retain; therefore, in the long term the students have gained more. Several studies have shown that students in project-based learning score higher on standardized testing (Bell, 2010; Solomon, 2003; Geier et al., 2008; Condliffe et al., 2016; Thomas, 2000). It is important to note that many of the studies in which students score high in standardized testing are longitudinal studies in which students have been exposed to project-based learning for a longer period of time (Boaler, 2002; Geier et al., 2008) or schools have adopted project-based learning schoolwide such as the Co-nect schools (Solomon, 2003) or Expeditionary Learning (EL) schools. EL schools also fall under the category of project-based learning. Students are more successful when the project-based learning takes place through well-developed programs (David, 2008) such as has been developed by the Buck Institute for Education or Expeditionary Learning, as opposed to programs developed by individual teachers in classrooms. This does not mean that project-based learning in an individual classroom has no value.

Project-based learning has been shown to be effective in helping to develop higher-order thinking skills such as problem solving and critical thinking (Beckett, 2002; Mitchell et al., 2009; Bell, 2010; Holmes & Hwang, 2016) as well as improve content knowledge (Coyne et al., 2016) and recall of important information (Sanson-Fisher & Lynagh, 2005). Other studies have shown

that project-based learning can help students learn new concepts faster and transfer those concepts to discussion (Beckett, 2002), showing deeper learning (Frame et al., 2015). In terms of academic achievement, the research of Wirkala & Kuhn (2011) showed superior mastery in comprehension among project-based learning students, and project-based learning decreased the achievement gap among certain demographic groups and math levels (Holmes & Hwang, 2016) as well as improved growth rates on math scores compared to other students (Thomas, 2000).

Other Benefits. There are multiple areas of learning to consider beyond the cognitive domain. While these other areas of learning are not specifically cognitive, some are indirectly related to cognition and may aid in cognitive improvement. Research studies show project-based learning benefits students in several learning-related areas. Project-based learning developed decision-making skills (Beckett, 2002; Thomas, 2000; Bell, 2010) in addition to improving problem-solving skills. Boaler's (2002) longitudinal study showed that students had less math anxiety as a result of project-based learning. Researches have seen an increase in student self-regulation and self-monitoring as well as improvement in planning (Mitchell et al., 2009; Blumenfeld et al., 1991), which complements research indicating students in project-based learning develop independence from teachers and are more actively involved in learning (Beckett, 2002; Sungur & Tekkaya, 2006). Students showed better attitudes toward school and learning (Bas & Beyhan, 2010) while increasing attendance (Sanson-Fisher & Lynagh, 2005) as they saw that learning was more meaningful (Marwan, 2015), and they enjoyed the process of learning more (Bas & Beyhan, 2010). The ability to work in groups is critical in project-based learning, and researchers have also seen that students are more collaborative (Coyne et al., 2016), and project-based learning helps in group dynamics (Cerezo, 2004). This means that the process of collaboration and group work has caused students to work on group dynamic skills and

improve the process of collaboration through practice and teacher intervention. Improvement in these areas does not happen simply through forcing students to work in groups and collaborate. Project-based learning also facilitated students becoming better researchers (Bell, 2010) and improved work habits and motivation (Thomas, 2000). As students attempt to connect school learning to the world outside of school, they began to look for meaning in what they were learning at school, and project-based learning helped students make this connection (Gultekin, 2005).

Comparison of learning. Most research completed on project-based learning examines specific aspects related to the project and the learner, including the efficacy of project-based learning. Little research compares project-based learning to traditional learning. The research available does little to support the superiority of project-based learning over traditional learning as it applies to academic achievement (Sanson-Fisher & Lynagh, 2005). Some studies show students have equal gains when compared to traditional learning (Holmes & Hwang, 2016; Dobbs, 2008; Dochy et al., 2003; Schauber et al., 2015). While Scott (2005) found that both groups achieved, the traditional learners achieved with a statistically significant higher score.

Conflicting research. Research shows conflicting results on the efficacy of project-based learning when it is compared to traditional learning (Dobbs, 2008), and this causes many educators to question whether a change in teaching methods is necessary. Some studies have shown that without prior knowledge, the academic gains are minimal and may even be detrimental to those with superficial knowledge (Kirschner et al., 2006; Holmes & Hwang, 2016). Others question whether the research on the K-12 level is rigorous enough or whether enough research exists to make conclusions at this point (Wirkala & Kuhn, 2011). Bas and Beyhan (2010) take this a step further by suggesting there is insufficient research that shows

project-based learning is a proven alternative to traditional learning, and the shift toward project-based learning is based primarily on perception over sound research. Sanson-Fisher and Lynagh (2005) also suggest there is not enough empirical data to support project-based learning as advantageous in providing positive educational outcomes. Traditional education has been found to be more effective for short-term retention in some students when measured on standardized tests (Strobel & Van Barnveld, 2009). Still others simply point to the research available that suggests project-based learning is not as effective as other types of learning as reason to not pursue or use project-based learning. (Bas & Beyhan, 2010; Sanson-Fisher & Lynagh, 2005; Strobel & Van Barnveld, 2009; Kirschner et al., 2006; Dobbs, 2008; Wirkala & Kuhn, 2011; Dochy et al., 2003; Scott, 2005; Hodges, 2010) According to Vernon & Blake (1993), academic achievement that is knowledge-based favored traditional learning. Research done in the medical field shows that traditional learning yielded better results for basic science knowledge (Kalaian, Mullan, & Kasim, 1999), and Colliver (2000) found no convincing evidence that project-based learning improved knowledge bases in students. Research by Kirschner et al. (2006) found that unguided instruction was less effective, and there were negative results when students acquired misconceptions or incomplete knowledge due to a lack of teacher support. These researchers suggest that due to the nature of project-based learning, misconceptions and incomplete knowledge are likely to result.

Example of project-based learning

Proponents of project-based learning will point to experiential examples of how project-based learning is effective at engaging students and developing necessary 21st century skills. Formerly known as Expeditionary Learning Schools, EL schools integrate project-based learning through the schools to various degrees. The vision of EL is to create better human beings and

not better test-takers (Berger, 2016). Berger goes on to suggest that in life, students are judged by their character and quality of work and not their ability to take tests. With this as the foundation, this researcher attended a conference in which Berger presented an example of how EL used project-based learning, which affected students, teachers, and a community. In one urban school, students walked past homeless people on a daily basis and even stepped over them when they entered the school each day. When a group of 3rd graders questioned the teacher about who the homeless people were, and why they were there, the teacher was not able to give them a good answer. The school then used project-based learning to help students investigate the problem of homelessness in their neighborhood. The students interviewed the homeless people they once walked past, heard their stories and wrote about them, researched the problem of homelessness and causes, investigated possible solutions, and eventually created a book that told the story of homelessness. This book included stories of the homeless people they interviewed, and was eventually published and distributed to parents, school personnel, students, and the homeless people in the neighborhood. At the conclusion of the project, students had more empathy and began calling the homeless people by name. The homeless people began to have feelings of dignity and worth when they did not have them before. While the project did not eliminate the problem of homelessness, the students and faculty at that school did not look at homeless people the same again, and awareness was raised. Many students have reported years later that they continued empathy and changed attitudes on into adulthood as a result of the project.

A second example of project-based learning involved a group of students who were attempting to rid an overgrown, wooded section of their campus from an invasive plant species. The students were using their outdoor work space and recognized that an invasive plant had

begun to take over large sections of the outdoor space limiting the students' access to research space. The invasive species was choking out the native plants and restricting the number of remaining native species. The students' first solution was to pull out the invasive plant. After several hours of work and coordination with large numbers of students on campus they realized this was not a viable option. The students then began to study this particular plant species to determine what other options there might be to rid the area of the plant. At the same time a student was studying a particular insect. There was limited knowledge as to the particular plants this insect would eat. The students began to coordinate their research efforts and wondered if the insect could be used to help rid the wooded area of the invasive plant species. After consulting with an entomologist and botanist at a local university the students decided to farm the insect and collect a specified number to introduce to the wooded area in an attempt to eradicate the invasive plant species. Both the entomologist and botanist said this was something that had not been attempted before. The students calculated the number of insects they would need based on the area of infestation. Once the insects were farmed they introduced them into the wooded area. While they did not completely eradicate the invasive species the insects did have an impact on the wooded area.

At this time the researcher was not able to find a documented example of project-based learning in which students examined historical events in order to learn lessons to help solve a real-world problem in the present. The lack of documentation in this area highlights the need for the research presented in this paper.

III. METHODOLOGY

Introduction

The purpose of this study was to determine whether students in a sixth-grade social studies classroom have greater academic achievement when taught by means of traditional methods as compared to those taught through project-based learning. The specific questions that were examined are as follows:

1. Do students score higher on questions involving lower-level thinking skills on Bloom's Taxonomy when taught with traditional means versus project-based learning?
2. Do students score higher on questions involving higher-level thinking skills on Bloom's taxonomy when taught with traditional means versus project-based learning?

Research design

The research design for this study was experimental. Students were randomly assigned to one of two sections of social studies classes. Both classes had the same objectives and unit of study, and the same teacher taught both sections. One section was taught through traditional means and the other section was taught through project-based learning. A coin flip determined which section received the project-based learning instructional method. Experimental research design is used when a study involves a comparison of two groups (Gay, Mills, & Airasian, 2012). The specific type of experimental approach was a comparison of a new approach and an existing approach (*A* versus *no A*). *A* represents project-based learning as it was

the new approach, and *no A* represents traditional learning, as it was the existing approach for the students in the study.

Prior to the study, the social studies class was taught primarily by traditional teaching methods in a teacher-centered format. Students were familiar with projects used at the culmination of a unit of study to demonstrate knowledge learned, not as a method of learning.

This was a post-test-only study. Both sections received the assigned instructional methods during their respective class time, during the third quarter of the schoolyear. Each class period was 47 minutes long. The study lasted for three and one half weeks. At the conclusion of the unit, each class section completed the same assessment for comparison purposes. The classroom teacher administered the assessment.

The traditional classroom was considered the control group; they were taught by means consistent with how they received instruction throughout the year. The project-based learning group was the experimental variable, while the independent variable was the method of instruction.

Setting and sample

The study took place in the sixth-grade classrooms in an urban, independent, religious school in central Florida. The majority of families in the school were upper-middle class. Fifty-five students participated in the study, making up the entire population of students in the two class sections. The students were randomly assigned to their respective classes by a computerized scheduler at the beginning of the school year. There were twenty-nine students in the traditional classroom and twenty-six students in the project-based learning classroom. One student from the project-based learning group was removed from the study due to excessive absences during the weeks of the study, leaving fifty-four total participants. There were twenty-

seven male and twenty-seven female student participants. Forty-seven of the students were Caucasian; three were Hispanic; three were African-American, and one was Native American. The classroom teacher had thirteen years of experience teaching at this school.

All parents were notified prior to the study and signed a letter of agreement, allowing their student scores to be a part of the study (See Appendix A). Students signed a consent form, allowing their scores to be used (See Appendix A). No parents or students opted out of the study.

Unit procedures

The unit taught was the ancient civilization of Greece. The standards addressed in this unit were from the New Generation Sunshine State Standards and can be found in Appendix B. The students studied the culture, geography, economics, and government of Ancient Greece. The project-based learning group spent the first few days of the unit discussing what was involved in project-based learning and identifying a real-world problem. The teacher lead a discussion centered on the question, "*Can studying something from an ancient civilization help us solve a modern day problem?"* The objective was to connect ancient Greece to modern times. Students divided into groups according to the topic they chose to research. The modern issues that were chosen to investigate were racism, children's rights, women's rights, respect for the military, and the Electoral College. Students spent the remainder of the time working in groups and researching their real-world problem. During this time the students also developed their artifact for presentation. The teacher spent at least a few minutes with each group every day. The teacher spent an extended amount of time with one group each day to assess progress and answer questions. Periodically, the teacher taught ten or fifteen minute mini-lessons to the entire

class on research related topics. Each group worked on a presentation explaining the issue they researched and the solution to the real-world problem they identified.

The traditional class used teacher-directed activities throughout the unit. Students read assigned passages from the textbook for homework certain evenings. The day after reading was assigned students completed notes over the textbook material. There was also class discussion and lecture over the material. Throughout the unit students completed various activities related to topics in the unit. Some of the activities were done individually and some of the work was done in groups. The activities completed covered the following topics- the geography of Greece, map skills, ancient Greece civilization comparisons, Venn diagram comparisons, understanding Greek citizenship, voter interviews, and government comparisons. Examples of worksheets can be found in Appendix C.

Instrumentation and materials

The post-unit assessment was a teacher-developed assessment that has been used for assessment purposes in this school for two years. A majority of the questions on the assessment were taken from the test bank that was developed by the publisher of the textbook, while the teacher developed the remainder of the questions. The assessment was in accordance with the administration-approved school curriculum guide and scope and sequence, verified by two accreditation commissions who accredit the school.

Each question on the assessment was assigned to a category of lower-level thinking or higher-level thinking in accordance with Bloom's taxonomy. Lower-level thinking questions ask students to remember, understand, and apply; higher-level thinking questions ask students to analyze, evaluate, and create (Anderson et al., 2001). An example of a lower-level thinking question is as follows: *Explain the problems that led to the Peloponnesian War*. An example of

a higher-level thinking question is as follows: *The German philosopher Hegel once wrote, What experience and history teach is this-That the nations and governments have never learned anything from history, or acted upon any lessons they might have drawn from it. Do you agree or disagree with this statement? Using what you understand about ancient Greece and our modern world, argue for or against Hegel's idea*. See Appendix D for a full copy of the assessment.

The independent variables examined were student grade point averages (GPA), semester social studies grades, and gender. GPA for each student was cumulative for the first semester and included grades from all academic classes. The semester social studies grade was determined by averaging the first and second quarter social studies grades.

Data analysis

Independent *t*-tests were conducted through SPSS to determine if groups were comparable on GPA and semester social studies grades before the instruction intervention was applied. Correlations were conducted to determine if there was a statistically significant correlation between the independent variables (GPA, semester social studies grade, and gender) and the dependent variables (lower-level questions and higher-level questions). Hierarchal multiple regression was then conducted to determine if semester social studies grades, gender, or GPA had a significant correlation to the dependent variables of lower-level questions and higher-level questions.

IV. RESULTS

Introduction

The purpose of this study was to determine the effectiveness of traditional teaching methods and project-based learning on the academic achievement of students by examining student performance on lower-level (LL) thinking and higher-level (HL) thinking questions according to Bloom's Taxonomy. The results of the study will be presented in this section.

Descriptive statistics

Independent samples *t* tests were conducted to compare the project-based learning and traditional groups for equality at the outset of the study. The grade point average (GPA) and semester social studies grades were used to compare the groups. The mean scores and standard deviation for the project-based learning and traditional groups comparing GPA and semester social studies grades can be found in Table 7.

Table 7

Group Statistics

	Class	N	Mean	Std. Deviation
GPA	Project-based	25	3.29	0.37
	Traditional	29	3.30	0.72
	Overall	54	3.30	0.69
Sem. SS Grade	Project-based	25	82.32	9.56
	Traditional	29	82.40	7.72
	Overall	54	82.36	8.54
LL Questions	Overall	54	45.17	21.92
HL Questions	Overall	54	67.85	22.97

Levene's indicated the differences in variances in GPA and semester social studies grades between the two groups was not statistically significant, and the independent samples *t* test also indicated the mean difference in GPA, $t(52)=0.08$, $p= 0.71$, and semester social studies grades, $t(52)=0.03$, $p=.39$, is not statistically significant. This indicates that the two groups were equivalent in terms of GPA and semester social studies grades at the outset of the study.

A Pearson's correlation test was conducted to determine if the independent variables (GPA, semester social studies grades, and gender) were related to the dependent variables (lower-level questions and higher-level questions). An examination of the Pearson Correlation revealed that statistically significant correlations existed between each of the variables with the exception of gender and lower-level questions. These variables were included in the final model

because the correlations are statistically significant. Gender was included in the model due to the statistically significant correlation with LL questions and was retained in the model for HL questions as well. See Table 8 for correlation results.

Table 8

Variable Correlations

		LL questions	HL questions
GPA	Pearson Correlation	.467***	.469***
Semester SS grade	Pearson Correlation	.564***	.635***
Gender	Pearson Correlation	.054	-.526***

Note. ***p< .001

The kurtosis for the GPA variable was slightly leptokurtic while semester social studies grades and LL question variables were slightly platykurtic. None of the kurtoses is at the statistically significant level.

There was a slight positive skew for semester social studies grades and HL questions and a slight negative skew for LL questions, although none were at the statistically significant level. The examination of the GPA skewness revealed a slight negative skew with two possible outliers. The two outliers were identified with z-scores of -3.31 and -2.48. All the analyses were run with and without the outliers, and it did not change the conclusion; therefore, the scores of the two outliers were used in the study. The examination of the descriptive statistics indicates that the sample is fairly normal.

Hypothesis 1

H_1- Students instructed by means of project-based learning will score lower on questions requiring lower-level skills on Bloom's Taxonomy.

A hierarchal multiple regression test was conducted to examine the impact of project-based learning on lower-level questions. The test controlled for GPA, semester social studies grades, and gender. Step 1 contained the variables gender, GPA, and semester social studies grades. Step 2 included the class grouping variable. Step 1 of the model accounted for 43% of the variance in LL scores. The class grouping variable accounted for an additional 22% of the variance in LL scores and was statistically significant, $p<.001$. The total model accounted for 65% of the variance in LL scores, and the model is statistically significant, $p<.001$. See Table 9.

Results from the test indicated that class grouping variable was a significant predictor of how well students will do on LL questions. On average, scores moving from traditional to project-based learning are expected to drop twenty-four points on LL questions. See Table 9.

Table 9

Predictors of LL questions

Predictor	ΔR^2	B	B	95% CI
Step 1	0.40***			
Gender		15.83*	0.37*	[5.51, 26.15]
Sem. SS Grade		1.59*	0.62*	[0.72, 2.46]
GPA			0.13	[-6.35, 14.73]
		4.18		
Step 2	0.63***			
Gender		1.52*	0.04*	[-8.07, 11.12]
Sem. SS Grade		1.29***	0.50***	[0.60, 1.98]
GPA		3.31	0.10	[-4.00, 11.61]
Class		-24.35***	-0.56***	[-33.03, -15.37]

Note. *p<.05. **p<.01 ***p<.001

Results supported Hypothesis 1 that students taught with project-based learning would have lower scores on LL questions than those taught with traditional learning.

Hypothesis 2

H_2- Students instructed by means of project-based learning will score higher on questions requiring higher-level skills on Bloom's Taxonomy.

A hierarchal multiple regression test was conducted to examine the impact of project-based learning on higher-level questions. The test controlled for GPA, semester social studies grades, and gender. Step 1 contained the variables gender, GPA, and semester social studies

grades. Step 2 included the class grouping variable. Step 1 of the model accounted for 49% of the variance in HL scores. The class grouping variable accounted for an additional 7% of the variance in LL scores and was statistically significant, $p.=.000$. The total model accounted for 55% of the variance in HL scores, and the model is statistically significant, $p<.001$. See table 10.

Results from the test indicated that class grouping is a significant predictor of how well students would do on HL questions. On average, scores moving from traditional to project-based learning increased by 14. See Table 10.

Table 10

Predictors of HL questions

Predictor	ΔR^2	B	B	95% CI
Step 1	0.46***			
Gender		-14.43*	-0.32*	[5.51, 26.15]
Sem. SS Grade		1.49*	0.55*	[0.72, 2.46]
GPA			-0.07	[-6.35, 14.73]
		-2.30		
Step 2	0.52***			
Gender		-6.16	-0.14	[-8.07, 11.12]
Sem. SS Grade		1.66***	0.62***	[0.60, 1.98]
GPA		-1.79	-0.05	[-4.00, 11.61]
Class		14.07**	0.31**	[-33.03, -15.37]

Note. *p<.05. **p<.01 ***p<.001

Results supported Hypothesis 2 that students taught with project-based learning would have higher scores on HL questions.

V. DISCUSSION

The purpose of this study was to examine the impact of two instructional methods on the achievement of students. The following two questions were considered.

1. Do students score higher on questions involving lower-level skills on Bloom's taxonomy when taught with project-based learning vs. traditional learning?
2. Do students score higher on questions involving higher-level skills on Bloom's taxonomy when taught with project-based learning vs. traditional learning?

These questions supported the following hypotheses.

H_1- Students instructed by means of project-based learning will score lower on questions requiring lower-level skills on Bloom's Taxonomy.

H_2- Students instructed by means of project-based learning will score higher on questions requiring higher-level skills on Bloom's Taxonomy.

Summary of findings

It was first necessary to determine if the two groups in the study were equitable. An examination of the student GPAs and semester social studies grades revealed that there were no significant academic differences between the two groups at the outset of the study. Next, correlation tests were conducted to determine if the independent variables (GPA, semester SS grades, gender) had a correlation to the outcome variables (LL scores, HL scores). Because there were statistically significant correlations involving each of the variables, they were all included in the model so the researcher could control for the independent variables. This allowed the

model to determine if the class grouping variable was a significant predictor of student achievement on LL and HL questions.

The results of the test indicate that students in the project-based learning class scored 24 points lower, on average, on lower-level questions than those in the traditional class. Results also indicate that students in the project-based learning class scored 14 points higher, on average, on higher-level questions than those in the traditional class.

Students in the project-based learning classroom worked on connecting current issues of concern to ancient history. The issues chosen by the students were military respect, women's rights, the Electoral College, children's rights, and racism. Each group developed an artifact that was to be shared with an appropriate audience. Students were able to use any resource as they investigated. Groups used resources such as textbooks, encyclopedias, the internet, and personal interviews as part of their research. The artifacts developed were videos for social media, keynote presentations, display boards, letters to parents, and a letter to the President. The design of the artifact was to share group findings with people outside the classroom.

The traditional class was more systematic in their approach to the unit as they were directed by the teacher and followed the unit in the textbook. The traditional class alternated reading pages from the textbook followed by notes and teacher-directed classroom discussion with worksheets on various aspects of ancient Greek civilization. Examples of the worksheets completed in the traditional class can be found in Appendix C. The worksheets did not simply require students to find information in the textbook. Higher-level thinking skills were required at times. This addresses the pre-conceived notion of some that worksheets are always bad or simply time-wasters. Students reviewed with the teacher as they normally do before an

assessment. Students in the traditional class also completed projects. These projects were presented in the classroom and were designed to present material learned in the unit.

At the conclusion of the unit the researcher went into each of the classrooms and interviewed the classes as a whole on their experiences in this unit. Student feedback will be included in the following section.

Implications

A review of the literature revealed mixed results on the cognitive effects of project-based learning when compared to traditional learning (Dobbs, 2008; Kirschner et al., 2006; Holmes & Hwang, 2016; Bas & Beyhan, 2010; Sanson-Fisher & Lynagh, 2005). This study was directed at the cognitive effects of students by examining an assessment in which questions were categorized as either lower-level or higher-level according to Bloom's Taxonomy of Learning. As predicted, students in the traditional group scored higher on the lower-level questions (an average of 24 points). Because the students were taught via traditional methods for the entire schoolyear, it is not surprising that they scored higher on these questions. The students were accustomed to this type of teaching and assessment. Lower-level questions tend to be more fact-based and rely on recall of information. In the traditional classroom the teacher directed the learning and, with the knowledge of the end of unit assessment, was able to ensure that all of the main topics were covered during the course of the unit. While material may not have been covered in-depth, the students in the traditional unit were exposed to all sections of the unit. This may not have been true of the project-based unit. Students' choice of a particular real-world problem may have directed them to research areas that possibly ignored key topics in the unit. This would result in little or no knowledge of other areas and resulted in lower assessment scores.

The students in the project-based group dealt with more specific ideas and were not required to memorize facts or specific information during the unit. The project-based students conveyed that they were concerned before the assessment that they would not do well since they did not prepare as they usually do. After the assessment, the project-based students felt they did not do well, and the traditional students felt they had performed as they normally do on assessments. Some students in the traditional group did convey they thought this test was hard. This could be due to the fact that there were more high-level questions than normal. The feeling of not doing well by the project-based group could have been in part due to the lack of facts that they learned and an overemphasis on low-level questions.

The students in the project-based group did score higher on the high-level questions than the traditional students. Students conveyed they did not feel confident before taking the assessment. At the conclusion of the assessment they said they did feel very good about questions that addressed their particular area of study. When the project-based students reached the high-level questions, they were able to write longer and in more detail about what they had learned.

When each group was asked whether they felt they would remember this information in two months, they had very different answers. Almost all of the students in the project-based group felt that they would remember at least seventy-five percent of the material they learned from this unit in two months, while only a few of the traditional students felt they would remember much, if any, of the information in two months. These responses reflect the research by Diffily (2002) and Dochy et al. (2003) that students in project-based learning will remember more and for a longer time period when they are more engaged in the learning.

It is important to consider student attitudes about learning. Twenty-six of the twenty-nine students in the traditional class rated how much they like social studies with a score of less than five on a scale of 1-10 with 10 being the most liked. Eighteen of the students in the project-based class said they enjoyed social studies more or the same when considering the project-based learning unit. Six students liked the unit less, citing they did not feel they had learned as much; they focused on one topic and didn't enjoy groups. Those that liked project-based learning more, or the same, cited the freedom to choose topics, working in groups, working on areas of interest, and more fun as reasons for enjoyment. The lack of satisfaction in the traditional group was because they felt they did the same thing they had been doing all year. They reported it was not fun; they felt like they were only learning facts, and there was too much individual work.

One concern at the outset of the study shared by the researcher, as well as the classroom teacher, was the lack of prior knowledge the teacher and students had in project-based learning. The students had not practiced developing their own problems for the project. The teacher received training from the researcher and read articles on project-based learning, but, per teacher feedback, felt the training was not as in-depth as needed to make the teacher confident. The researcher and teacher did meet as needed during the study to discuss problems that arose or address questions. The main issue that was discussed was the development of the real-world problem by the students and the degree to which the teacher could help with this development. Some of the students did express frustration at getting started with the project due to the difficulty of developing a real-world problem.

This research study seems to confirm that with the variety of learning styles and personalities of both students and teachers there is no single educational approach that will work with all students in every situation. The findings of this study suggest that there is a place for

traditional as well as inquiry-based learning approaches such as project-based learning. Some of the students in the traditional classroom did very well on the higher-level questions on the assessment. These students enjoy social studies and would likely learn the material regardless of the instructional methods. When students are successful in a given instructional atmosphere they tend to enjoy learning that way and do not see the need for change. Conversely, some of the students in the project-based learning groups did not connect with their groups and were not motivated to engage in the project. They would likely have done better and learned more in the traditional classroom. Improvements can be made in both instructional methods to be more effective, but both showed benefits among students.

The maturity of the students must also be considered when examining instructional methods. Project-based learning requires a certain amount of developmental maturity. Students must use abstract thinking to develop a real-world problem and connect that problem to the past. This is challenging for some younger middle school and elementary students. The maturity gap must also be considered when grouping students. More mature students can be frustrated when working with students who are less mature or unmotivated. Students can also become frustrated when they feel they are not able to contribute to the project. These issues must also be considered by the teacher. It would be beneficial to spend time working on these soft skills before a unit begins, or a teacher must scaffold to build these skills along the way for the students. This is an example of how a teacher's role in the classroom will likely change. Instead of focusing on presenting information, the teacher must focus on skill development to prepare the student for the type of learning he or she will experience. It does not appear the teacher will ever be rendered useless in the classroom regardless of the mode of learning.

Limitations and recommendations for future research

Assessments for project-based learning are artifacts that are often presented to individuals or groups outside of the school setting. Project-based learning also has variances in the actual material that will be examined by the student even within a given unit. These two factors make it difficult to design assessments that can be used to compare various instructional strategies. Comparing lower-level questions is an easier and more straightforward task as the students either know the material or do not know the material. Assessing higher-level skills can be more subjective and increases the difficulty of comparing scores.

One of the limitations of this study was the minimal time the teacher and students had to become familiar with project-based learning. While the teacher did have resources to help her gain knowledge and understanding of project-based learning, she had never previously utilized this type of instruction in the classroom. Before this study the students had no prior opportunity to develop real world problems or collaborate in this way, making this approach novel to the students. Students had to overcome these extraneous variables in addition to a new method of instruction.

Project-based learning can be used with single disciplines, but it is often used in cross-curricular classrooms. Future research needs to be conducted at the middle school level that would combine some of the core curriculum areas such as math, social studies, science or language arts.

Future research could also be conducted to determine the efficacy of these instructional methods over time in a longitudinal study. Students often forget information once they have taken the assessment and many admit they are only studying for the test. It would be helpful to examine how much material students retained two or three months after the unit was completed.

If students are expected to recall information later in life, knowing which instructional strategies best contribute to that end would be of great benefit in education.

Conclusion

If education is going to continue to prepare students for the future, then the methods used in the classroom must continue to develop the necessary skills that will allow students to be successful for years to come. There are numerous instructional methods used by educators across the country. Determining which methods are effective and will benefit students in the long-term can be a challenge. Determining student objectives is an important first step. Memorizing facts and information, which can be recalled quickly, is best accomplished through certain educational strategies. Developing students who can analyze data, solve problems, and work collaboratively requires a different set of instructional methods. Both traditional teaching methods and project-based learning have their place in education. The job of educators is to learn a variety of instructional methods and determine which approach is most effective for the objectives and situation given. In this way students will have the broadest educational experience and be most prepared for the future.

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APPENDICES

Appendix A

Dear Parents,

This year the faculty has been researching and exploring various educational strategies with the goal of determining the benefits of these instructional approaches. The upcoming 6th grade social studies unit will be taught using two distinct instructional methods. At the end of the unit an assessment will be given that will give us valuable information related to the efficacy of the instructional methods.

I am currently working toward my doctorate in education degree through Southeastern University, and I would like to use the results of the student assessments in my dissertation. No individual grades will be used in the dissertation and the scores of the students will be confidential and anonymous. No personally identifiable information will be shared.

By signing this letter you are agreeing to allow your child's assessment scores on this unit only to be used in my dissertation work. All students will participate in the unit whether their scores are used in the dissertation or not.

If you have questions please feel free to contact me or the chair of my dissertation committee. Our contact information can be found below.

Dissertation Committee Chair: Dr. Doug Roth, Southeastern University- 863-667-5000

Principal Investigator: Keith Overholt, Lakeland Christian School- 863-688-2771

I have read and understand the above consent and voluntarily agree to have my scores used in the study.

_____ _____

Parent Signature Date

_____

Print Child's Name

Dear Students,

This year the faculty has been researching and exploring various educational strategies with the goal of determining the benefits of these instructional approaches. The upcoming 6th grade social studies unit will be taught using two distinct instructional methods. At the end of the unit an assessment will be given that will give us valuable information related to the efficacy of the instructional methods.

I am currently working toward my doctorate in education degree through Southeastern University, and I would like to use the results of the student assessments in my dissertation. No individual grades will be used in the dissertation and the scores of the students will be confidential and anonymous. No personally identifiable information will be shared.

By signing this letter you are agreeing to allow your assessment scores on this unit only to be used in my dissertation work. All students will participate in the unit whether their scores are used in the dissertation or not.

If you have questions please feel free to contact me or the chair of my dissertation committee. Our contact information can be found below.

Dissertation Committee Chair: Dr. Doug Roth, Southeastern University- 863-667-5000

Principal Investigator: Keith Overholt, Lakeland Christian School- 863-688-2771

I have read and understand the above consent and voluntarily agree to have my scores used in the study.

_____ _____

Student Signature Date

_____

Printed Name

Appendix B

Sixth Grade Social Studies NGSSS

Civics and Government

SS.6.C.1.1 Identify democratic concepts developed in ancient Greece that served as a foundation for American constitutional democracy.

SS.6.C.2.1 Identify principles (civic participation, role of government) from ancient Greek and Roman civilizations which are reflected in the American political process today, and discuss their effect on the American Political process.

Economics

SS.6.E.1.3 Describe the following economic concepts as they relate to early civilization: scarcity, opportunity cost, supply and demand, barter, trade, productive resources (land, labor, capital, entrepreneurship).

SS.6.E.3.2 Categorize products that were traded among civilization, and give examples of barriers to trade of those products.

Geography

SS.6.G.1.5 Use scale, cardinal, and intermediate directions, and estimation of distances between places on current and ancient maps of the world.

SS.6.G.2.1 Explain how major physical characteristics, natural resources, climate, and absolute and relative locations have influenced settlement, interactions, and the economies of ancient civilizations of the world.

SS.6.G.2.4 Explain how the geographical location of ancient civilizations contributed to the culture and politics of those societies.

SS.6.G.2.5 Interpret how geographic boundaries invite or limit interaction with other regions and cultures.

SS.6.G.2.6 Explain the concept of cultural diffusion, and identify the influences of different ancient cultures on one another.

SS.6.G.3.1 Explain how the physical landscape has affected the development of agriculture and industry in the ancient world.

SS.6.G.5.1 Identify the methods used to compensate for the scarcity of resources in the ancient world.

World History

SS.6.W.1.1 Use timelines to identify chronological order of historical events.

SS.6.W.1.2 Identify terms (decade, century, epoch, era, millennium, BC/BCE, AD/CE) and designations of time periods.

SS.6.W.1.3 Interpret primary and secondary sources.

SS.6.W.2.3 Identify the characteristics of civilization.

SS.6.W.2.4 Compare the economic, political, social, and religious institutions of ancient river civilizations.

SS.6.W.3.2 Explain the democratic concepts (polis, civic participation and voting rights, legislative bodies, written constitutions, rule of law) developed in ancient Greece.

SS.6.W.3.3 Compare life in Athens and Sparta (government and the status of citizens, women and children, foreigners, helots).

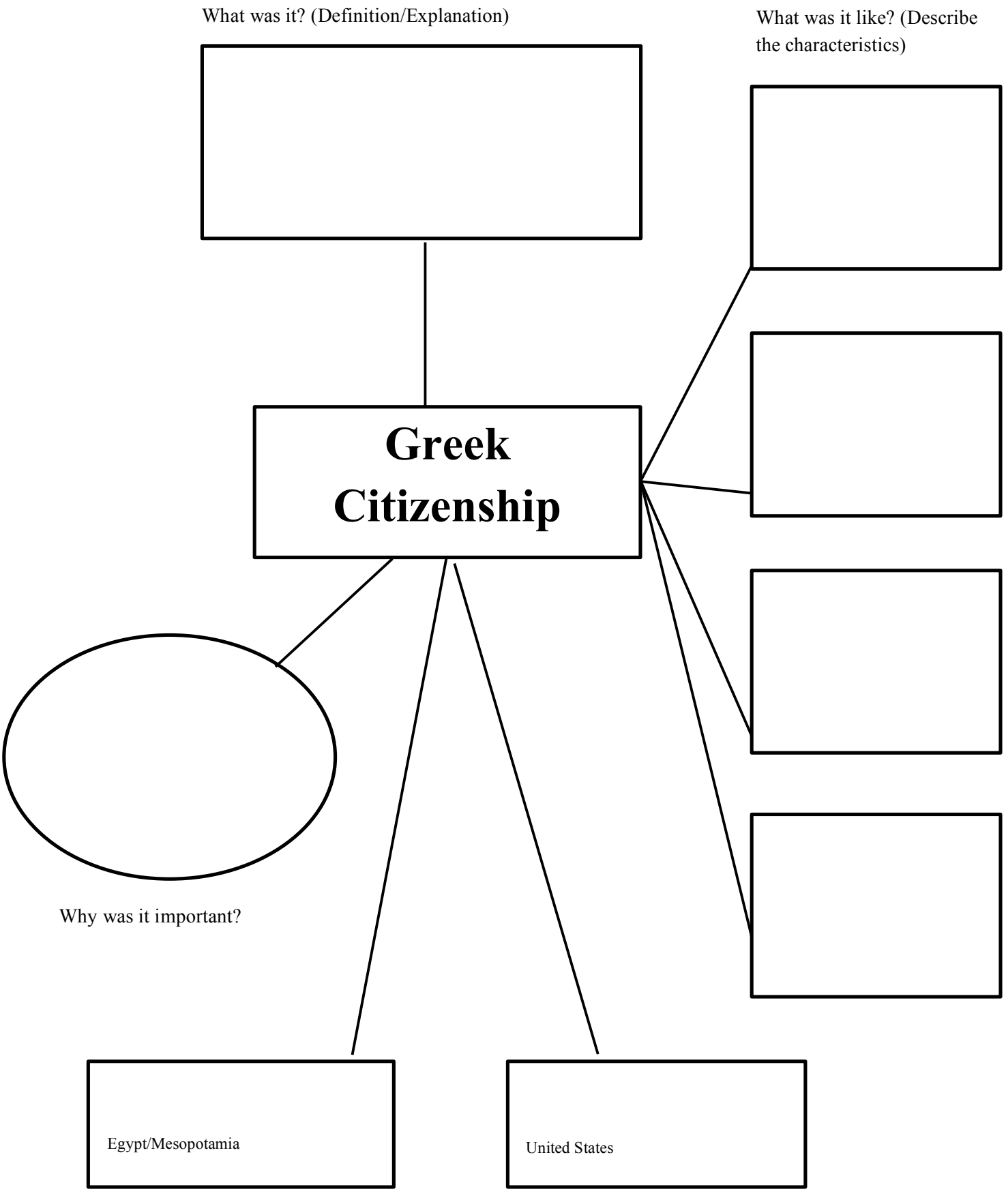
SS.6.W.3.4 Explain the causes and effects of the Persian and Peloponnesian Wars.

SS.6.W.3.5 Summarize the important achievements and contributions of ancient Greek civilization.

SS.6.W.3.6 Determine the impact of key figures from ancient Greece.

SS.6.W.3.7 Summarize the key achievements, contributions, and figures associated with The Hellenistic Period.

Appendix C


What was it? (Definition/Explanation)
What was it like? (Describe the characteristics)
Greek Citizenship
Why was it important?
Egypt/Mesopotamia
United States

Sparta vs. Athens

Group work: Read p. 185-189. Complete the Venn Diagram with your small group as shown on the Smartboard.

Individual work: Write one paragraph explaining the similarities between Athens and Sparta and one paragraph explaining the differences. Include an introductory sentence at the beginning to explain the purpose/topic. Be sure to use capital letters, end punctuation, and correct spelling.

To submit, follow one of these options:

- Write neatly on notebook paper with a correct heading at the top of the page. Skip lines and indent each paragraph.
- Type in Pages with a correct heading at the top of the page. Double-space (Line Spacing 2) and indent each paragraph. Submit in Moodle under Unit 7 Ancient Greece.

The Venn Diagram will become part of the notes to study for your test.

Voter Interview

Name: _____ Period: _____ Date: _____

Person Interviewed: _____

Relationship to Me: _____

Read/retell this statement to the interviewee: In Social Studies we are learning about the ancient Greeks. We have learned that democracy began in Greece and are making comparisons with the democracy found in the United States. I would like to ask you some questions about your views on political issues in the United States today to help me make better comparisons.

Are you registered to vote as a/an…

Democrat Republican Independent

Where do you get information about politics and government issues?

(Circle all that apply)

Newspaper (print) TV News Debates Social Media

Newspaper (online) Interviews Other: _____

How would you define the word "citizen?"

_____

_____

What do you think are some responsibilities we have as American citizens?

_____

_____

Do you think that it is important for all citizens to vote? Why or why not?

_____

_____

How would you define the word “democracy?”

_____

_____

Do you think we have gender equality in the United States? Why or why not?

_____

_____

After the interview, be sure to thank the interviewee for taking the time to help you!

Appendix D

Unit 8, Ancient Greece

Name: _____ Period: _____ Date: _____

I. Terms. Choose 3 out of the 5 words listed below. Write a sentence about ancient Greece that explains the meaning of the word.

colony polis agora helots cavalry

1._____

_____

2._____

_____

3.

_____

_____

II. Multiple Choice. Choose the best answer for each statement. Write the answer on the blank.

_____4. Who established the Council of 500 to manage daily affairs in Athens?

A. Solon
B. Homer
C. Cleisthenes
D. Aesop

_____5. Education in Athens differed from Sparta because in Athens they focused on

A. advancing the arts.
B. preparing men to be good citizens.
C. training soldiers.
D. having debate contests.

_____6. The earliest civilization, whose ruins were discovered by Arthur Evans, was the

A. Mycenaean.

B. Dorian.
C. Minoan.
D. Hellene.

_____7. The Hellenes are best remembered for their development of
A. iron weapons and farming tools.
B. the written Greek alphabet.
C. their palace ruins at Knossos.
D. their bronze work.

_____8. To defeat Persia, Athens worked together with
A. Anatolia.
B. France.
C. Rome.
D. Sparta.

_____9. The original purpose of the Delian League was to
A. conquer new lands for Athens.
B. protect the Greek city-states.
C. improve farming production.
D. build new temples and buildings.

_____10. Under Alexander the Great, cultural diffusion spread the ___ language throughout the empire.
A. Greek.
B. English.
C. Latin.
D. Macedonian.

_____11. Which of the following was NOT a requirement for early citizenship?
A. free male
B. own land
C. noble family
D. born in the polis

_____12. The Peloponnesian War was mainly fought between
A. Athens and Macedonia.
B. Egypt and Macedonia.
C. Sparta and Athens.
D. Persia and Athens.

_____13. What change did Peisistratus bring to Athenian democracy?
A. voting rights for women
B. citizenship for those who did not own land
C. appointed 2 kings to rule
D. freed the slaves

_____14. In which city-state did women have more freedom and the right to own property?
A. Sparta
B. Athens

_____15. Why did Alexander stop his conquest when he reached India?
A. He was too old to fight anymore.
B. His wife was sick and needed him at home.
C. His soldiers wanted to go home.
D. The Indian people were too strong for him to defeat.

_____16. The concept of citizenship in ancient Athens differed from places such as Egypt and Mesopotamia, because in Egypt and Mesopotamia
A. all people were equal.
B. the king made all important decisions.
C. a person could easily change social classes.
D. foreigners were welcome to become citizens.

_____17. Why did Pericles use the funeral of Athenian soldiers as the chance to explain the importance of democracy?
A. He wanted people to believe the soldiers' deaths were worthwhile.
B. He didn't have many opportunities to speak to a large crowd.
C. He was up for election the next year.
D. He didn't care about the people of Athens.

Primary Source (from Pericles' Funeral Oration)
"Our constitution...favors the many instead of the few;
this is why it is called a democracy."

_____18. In the statement above, Pericles is saying that
A. their government is not truly a democracy.
B. their government has favorites among the people.
C. their government works for the good of all citizens.
D. their government does not have a constitution.

III. Short Answer. Answer each question in 1-2 complete sentences.

19. How did the geography of Greece affect the development of civilization in ancient Greece?

_____

_____

_____

20. Why did the city-states in Greece need to establish colonies in other places?

_____

_____

21. Although Alexander the Great only ruled for 12 years, his reign had a lasting impact on the Mediterranean world. Think about the legacy of Alexander the Great. Select the part of his legacy that you think had the greatest impact on the world and explain why you think its impact was the greatest.

_____

_____

_____

22. Explain the problems that led to the Peloponnesian War.

_____

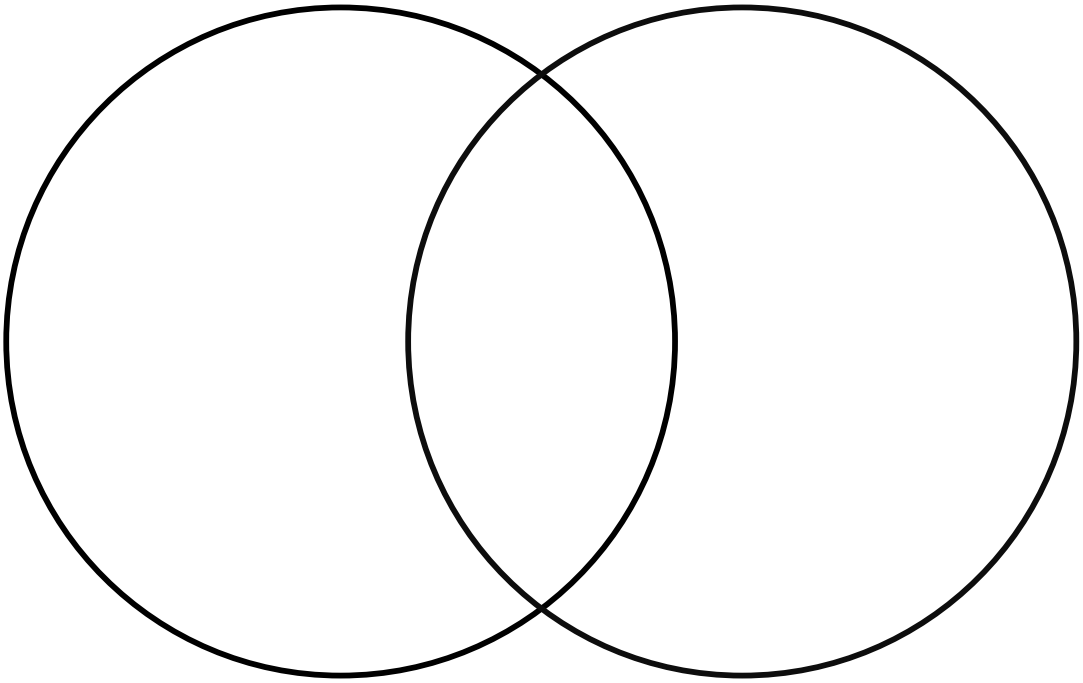
_____

_____

23. Complete both parts of the question as instructed.

A. Create a Venn diagram to compare and contrast 2 of the following types of government that developed in ancient Greece:

monarchy aristocracy oligarchy tyranny democracy



24-25. If the Sophists, Socrates, Plato, or Aristotle were teachers in a school today, would a typical school day change? What might it look like? Choose one of these thinkers/groups and describe a modern school day under this teacher.

26-27. The German philosopher Hegel once wrote:

> **What experience and history teach is this—that nations and governments have never learned anything from history,**
> **or acted upon any lessons they might have drawn from it.**

Do you agree or disagree with this statement? Using what you understand about ancient Greece and our modern world, argue for or against Hegel's idea. You can write an essay, draw a diagram, or use words and pictures to explain your thinking.