INFUSING SELF-REGULATION LEARNING PROCESSES INTO PROJECT-BASED LEARNING

by

Rory B. Dippold
A Dissertation
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of
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The Requirements for the Degree
of
Doctor of Philosophy
Education

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Date: ______________________________ Spring Semester 2015
George Mason University
Fairfax, VA
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DEDICATION

I dedicate this dissertation to my parents who have taught me the values of hard work, perseverance and passion for learning
ACKNOWLEDGEMENTS

I would like to first acknowledge my father and mother who taught me the values of hard work, persistence and pursuing my dreams with passion. I am forever grateful for their love, support and guidance throughout the years. I also appreciate my brothers John, Alex and Matt for their support and for being important role models in my life.

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Most importantly, I would like to thank my wife, Kathleen, for her constant generosity, encouragement and love throughout the process.
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<td>Civics &amp; Economics</td>
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<td>Grade Point Average</td>
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<td>No Child Left Behind</td>
<td>NCLB</td>
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<td>Organisation for Economic Co-Operation and Development</td>
<td>OECD</td>
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<td>Project-based learning</td>
<td>PBL</td>
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<tr>
<td>Secretary Commission on Achieving Necessary Skills</td>
<td>SCANS</td>
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<td>Self-Determination Theory</td>
<td>SDT</td>
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<td>Self-efficacy</td>
<td>SE</td>
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<td>Self-regulation Coach</td>
<td>SRC</td>
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<td>Self-regulated Empowerment Program</td>
<td>SREP</td>
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<td>Self-regulated learning</td>
<td>SRL</td>
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<td>Statewide Systematic Initiative</td>
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ABSTRACT

INFUSING SELF-REGULATION LEARNING PROCESSES INTO PROJECT-BASED LEARNING

Rory B. Dippold, Ph. D.

George Mason University, 2015

Dissertation Director: Dr. Anastasia Kitsantas

The purpose of this quasi-experimental mixed method study was to examine how infusing self-regulation learning processes into a middle school project-based learning (PBL) unit impacted student motivation and achievement. The study examined: (a) whether differences existed between the treatment and comparison groups in self-efficacy, content knowledge and project artifact achievement (b) how students in the treatment group self-regulate in a self-regulation learning (SRL) infused PBL environment, and (c) how high and low achieving students self-regulate in a PBL environment. Fifty two (N = 52) seventh-grade students participated in the seven week Business PBL unit and completed a pretest and posttest on two self-efficacy measures, a content knowledge test and project artifacts. Treatment participants exposed to the SRL intervention based on Zimmerman social-cognitive perspective of SRL also completed project artifact reflections and progress feedback forms prior to the unit. ANCOVA results showed self-efficacy learning form (SELF) scores were statistically significant for
the treatment group compared to the comparison group and project artifact t-test results had modest gains for the treatment group, but were not significant. However, there were no significant differences for Children’s Self-efficacy for Self-regulated Learning or content knowledge. In regards to examining how students in the treatment group self-regulated in a SRL infused environment, data revealed that they used primarily planning, environmental structuring, self-consequating, and attributions. Further, analyses showed that high achieving students exhibited several more SRL strategies than low achieving students and the low achieving students used maladaptive practices that hindered their progress. Based on the findings, educational implications for practice and future research are discussed.
CHAPTER ONE

Technological advancements and globalization have led to the world being transformed into an interconnected knowledge economy (Friedman, 2007; Wagner, 2008). This shift began in 1991 when “Knowledge age” expenditures (e.g. computers and automated services) outnumbered Industrial age (e.g. manufacturing and transportation) spending. Since 1991, the shift has steadily increased at a rapid rate to moving and managing information through technology, helping to change the way we live and think (Trilling & Fadel, 2009). For the purpose of this paper, the knowledge economy is being defined as using technological advancements to communicate, create, collaborate and innovate to produce goods and services (Trilling & Fadel, 2009). In this new era, there is a need for all people to know how to think, problem solve and effectively communicate (Wagner, 2008). A knowledge economy is impacting most types of work and there are fewer certainties in the world because of rapid advancements in technology and the need to maintain a competitive edge (Adams & Hamm, 2005). In summary, it demands a change in skills and knowledge acquired by all people (Friedman, 2007; Prensky, 2001; Wagner, 2008).

Background on the Problem

The growing concerns about what students know and are able to do have been well documented for decades (Keck, 2009; National Academy of Science, 1984; National
Commission on Excellence in Education, 1983; Prensky, 2001). This section will address the problems in education by providing a history of reform efforts in the late 20th century leading up to state exemptions from No Child Left Behind (NCLB) by President Obama. It will discuss NCLB and its effects on curriculum and instruction, student motivation, problem solving and its impact on competing in a global knowledge economy. Lastly, this section will focus on workplace skills and how many students are unprepared for their future after their K-12 schooling.

The need for preparing students with workplace readiness skills has been a common discussion for several decades from educators to businesses. *A Nation At Risk* report (National Commission on Excellence in Education, 1983) was the first in the late 20th century to alert the public about the lack of preparation in public schools. The report provided many indicators of risk in our educational system by including business and military leaders explaining the need to provide additional remediation in basic skills such as reading, writing and math. Furthermore, the Department of the Navy stated that a quarter of its recruits could not read at a 9th grade level needed to read safety directions. Shortly after the report, *The National Academy of Science* (1984) established a diverse panel of public and private sector employers, university scholars and education community to identify “necessary skills” that employees would need. They included reasoning and problem solving, reading, writing and oral communication, and personal work habits and attitudes.

The next major call for reform was in the Secretary’s Commission on Achieving Necessary Skills (SCANS) for America 2000. It was commissioned by the Secretary of
Labor and the report entitled *What Work Requires of Schools* (U.S. Department of Labor, 1991) was issued to determine the skills students need to graduate high school. The report stated all high school students should leave school with the know-how to be prepared for the future. This know-how had two parts: competence and a foundation of skills and personal qualities. The three-part foundation and skills needed for job performance include basic skills (e.g. reading, writing, speaking and listening), thinking skills and personal qualities (e.g. individual responsibility, self-management). There are five areas identified that effective workers will be able to use:

- **Resources** (know how to effectively use time, money, materials, space and staff)
- **Interpersonal Skills** (Work well on teams, serve customers, negotiate)
- **Information** (Acquire and evaluate data, interpret and communicate, use computers to process information)
- **Systems** (Design, monitor and correct performance of social, organizational and technological systems)
- **Technology** (Select equipment and tools, apply technology to specific tasks)

In many respects, the United States (U.S.) education system remains disconnected from the knowledge and skills the world requires. A continuing problem is reform movements focused on results that inadequately prepare students for their future, such as No Child Left Behind (NCLB) legislation.
NCLB. NCLB legislation (United States Department of Education, 2002) was passed by bipartisan support in Congress with a focus on test scores and accountability measures for teacher quality and school improvement. The federal law mandated states to measure performance by conducting state-wide assessments in basic reading and math skills in grades third – eighth and at least once in high school. Every year, schools were evaluated based on test scores with the requirement to meet an annual yearly progress (AYP) goal that increases every year until 2014 when it is a 100% pass rate. Schools that did not meet AYP as a school or even in subgroups with a specific number are considered “failing” due to continuous non-achieving pass rates which can eventually cause staff and curriculum changes within the school. More recently, President Obama took action in September 2011 to revise the Elementary and Secondary Education Act (ESEA), also known as No Child Left Behind, after Congress did not reauthorize it. States may apply for waivers from NCLB. One of the main provisions of this change is that accountability system is based on student growth and progress and not a “one size fits all” proficiency score (Abramson, 2011). Despite these revisions, the focus remains on testing. The result of publicizing state test scores and the focus on high-stakes testing has put more emphasis and pressure on educators to raise standardized test scores (Wagner, 2008). For the past decade, high-stakes tests mainly in the form of multiple choice testing has driven instruction focused mainly on facts and recall (Wagner, 2008), reduced the focus on humanities and narrowed the curriculum (Fuller, 2007). The high stakes testing may be partly to blame for a lack of high school graduates ability to apply skills and focus on test preparation (McLester & McIntire, 2006). Research has shown teachers focus on more
traditional teaching methods and remediation, instead of extension, when feeling pressured in a high-stakes environment (Moon, Brighton, & Callahan, 2003).

**Teaching to the test.** Even before NCLB, the U.S. education system had been recognized as inadequately preparing students for their futures. However, how has NCLB and the general increase in testing impacted the U.S. educational system? Has it prepared or not prepared students for the challenges existing in the 21st century?

In an extensive study published by the National Institute of Child Health and Human Development, University of Virginia researchers observed elementary schools in 2005 to understand the quantity and quality of instruction in America’s schools (Pianta, Belsky, Houts, & Morrison, 2007). The study took place in 10 U.S. sites, in more than 1,000 elementary schools and 400 school districts, serving mostly middle class students in first, third and fifth grades. Over 90% of the teachers observed were certified and 44% had master’s degrees. Although not a national representative sample, the findings provide some explanation for the current education system. In fifth grade classrooms, over 90% of the time was spent working in whole-group or individual-seatwork settings with as little as seven percent in small-group instruction. The average fifth grader received five times more basic skill instruction than problem solving or reasoning instruction. Moreover, there was generally only one method of instruction used in a given 20 minute instruction period. Although there was an increase in math and English language arts (ELA) instruction during NCLB, 79% of middle schools and 76% of high schools changed their ELA curriculum “somewhat” or to “a great extent” to emphasize
tested content. Similar curriculum practices were also implemented in math (Wagner, 2008).

Unfortunately, the narrowing of curriculum and instruction focused on testing also had devastating effects on students’ motivation, problem solving and interest in schools. Prensky (2001) notes that the “tell-test” method of teaching, focused on telling students information by lectures or readings and then testing them, is ineffective and boring. Students come to school with so many technological experiences (e.g. computers, internet, video production), but the schools are incompatible with the way that learners interact and learn outside the classroom. The failure of tell-teaching is summarized as “…the world of the learner has changed so dramatically. As a result, learners no longer see themselves as receptacles to be filled up with content, but creators and doers” (Prensky, 2001, p. 76). Students have the capability to learn real-world experiences outside the school by collaborating, communicating and problem solving using technological advances, such as Facebook, Twitter, YouTube and other social media. Yet, the standardization culture focuses on moving all students toward the same educational goals helping to minimizes students’ personal knowledge, interests, skills and experiences (Christensen, Horn, & Johnson, 2008). The results have been devastating for student motivation and interest in school.

An educational system that focuses moving all students toward the same goals has had significant effects on student perspectives of school. According to a 2009 national survey conducted with more than 42,000 students in 103 schools across 27 states, results
were that 66% of high school students reported being bored in class at least once a day and 17% stated they were bored in every class in high school (Yazzie-Mintz, 2009).

Unfortunately, boredom can have the greatest impact on the most at-risk in our society as shown in a report by Civic Enterprises entitled The Silent Epidemic: Perspectives of High School Dropouts (Bridgeland, Dululio, & Morrison, 2006). They interviewed four focus groups of ethically and diverse students ages 16-24 and interviewed 467 ethnically and diverse students ages 16 – 25 who dropped out of public high schools in 25 different locations comprised of cities, suburbs and small towns with high dropout rates. While 81% realized that graduating from high school was an important step toward success, the number one reason for dropping out (47%) was that classes were not interesting. The student comments included that the classes were irrelevant; teachers just told them what to do without student involvement. When asked what would have improved their chances of graduating, 81% of survey respondents suggested providing real-world learning opportunities (Bridgeland et al., 2006).

Moreover, the report from the Alliance for Excellent Education (2007) entitled, High School Teaching for the Twenty-First Century: Preparing Students for College found that 65% of college professors believe what is taught in high school does not prepare students for college coursework. Wagner (2008) concludes that most significant impact NCLB has may be increasing the “global achievement gap” between what students learn and what they need to be able to do in the world today.

**Competing in the knowledge economy.** The archaic curriculum and instruction approaches found in many schools have had long-term economic and societal impacts.
The economic impact can be seen in the high school dropout rates, remediation courses and the retraining companies must undertake. For instance, four out of every ten high school dropouts (ages 16-24) received some kind of government assistance in 2001 (Bridgeland et al., 2006). Forty percent of all college bound students need to take remedial courses (Wagner, 2008) and the U.S. has the highest dropout rate of all developed countries (Soares & Mazzeo, 2008). In the report, *Are They Really Ready to Work?* (2006) found 50% of employers believed that high school graduates entering the workforce are “deficient” in their preparation.

Similar concerns are reflected in the most recent National Assessment of Education Progress (U.S. Education Department, 2013), sometimes referred to as the Nation’s Report Card. In 2013, 92,000 high school seniors took tests to measure their reading and math skills with scores unchanged since the last test in 2009. The results showed that only 26% of seniors scored proficient or advanced in math and 38% scored proficient or advanced in reading. Proficient means having solid academic performance that includes competency over challenging subject matter. Proficiency is between the level of advanced and basic.

When comparing student achievement with other nations, the United States falls far short as a global power. The Organisation for Economic Co-Operation and Development (OECD) published the 2012 report of the *Programme for International Student Assessment* (PISA). PISA was intended to measure science, reading and math knowledge, but also students’ ability to apply knowledge to new situations. The focus was also on mastery of processes and understanding of concepts. The sample included
15 year-olds from 65 countries and educational systems with the tests administered to 4,500 to 10,000 students in each country. The U.S. students scored below the OECD average on mathematics scale and the OECD average in science and overall reading scores, which remained unchanged from 2009. On a more positive note, the PISA (2013) began the first international assessment that measured creative problem solving skills and the U.S. scored above average. However, the U.S. fell far below the top 10 countries in that category. What can be done to change this tide of mediocrity?

**Workplace readiness skills.** There are many terms used to discuss preparing students for life after K-12 schooling including career readiness, college readiness, workplace readiness and 21st century skills. For the purpose of this paper, the term workplace readiness skills will be used because it is broadly defined as the skills and knowledge students need leaving K-12 schooling to meet the demands of the 21st century. According to *Up to the Challenge: The Role of Career and Technical Education and 21st Century Skills in College and Career Readiness* report (Partnership for 21st century Skills, 2010), workplace readiness skills are personal qualities, skills and knowledge that employers find necessary for success in a 21st century workplace, such as problem-solving, flexibility and presentation skills. The current American education system in many ways is incompatible with preparing students for 21st century workplace readiness skills.

In the 21st century workplace, the demand for graduates to come prepared with certain skills and knowledge is even more paramount, because of the technological and global economic demands. According to Society For Human Resource Management
report titled, *Critical Skills Needs and Resources for the Changing Workforce* (2008), 55% of the human resource professionals believed that workers who enter the job force in the next 10 years will lack the necessary skills to be successful. In addition, the same survey found that companies believe workplace readiness skills are becoming increasingly important, specifically the following: adaptability/flexibility, critical thinking/problem solving, leadership, professionalism/work ethic and teamwork/collaboration. However, the United States is falling behind other countries in educational performance (Partnership for 21st Century skills, 2006; Symposium on Workforce Readiness, 2007).

Similar results were found in a national survey conducted by the following partnerships: The Conference Board, Corporate Voices for Working Families, Partnership for 21st Century Skills, and the Society for Human Resource Management report *Are They Really Ready to Work?* (2006). The study found that applied skills are four of the top five “very important” skills for high school graduates and two-year college/technical school graduates to obtain. For college graduates, the top five were all applied skills: oral communication, teamwork, professionalism, written communication and critical thinking/problem solving. The lowest six ratings were content knowledge subjects: Mathematics, science, foreign language, government/economics and the last two were either history/geography or humanities/arts. This survey demonstrates the desire of employers to have students who have knowledge, but are also able to apply it to different skills and attitudes necessary in the workplace. The same report found that 75% of employers believed K-12 schools should be responsible for teaching basic knowledge
and applied skills (The Conference Board, 2006). Yet, the executive summary report on the 2007 Symposium on Workforce Readiness stated, “…the U.S. educational system is not producing quantity and quality of graduates needed.” President Obama echoed similar sentiments by proclaiming on March 10, 2009 that “… American education is untenable for our economy, unsustainable for our democracy and unacceptable for our children, and we cannot afford to let it continue.” He demanded that states develop standards "that don't simply measure whether students can fill in a bubble on a test but whether they possess 21st century skills like problem-solving and critical thinking, entrepreneurship and creativity" (Keck, 2009, p.1). There are no simple solutions to the problems that exist in our education system, but there is emerging research showing promise toward changes in instruction which can motivate students to learn workplace skills.

Project-based learning (PBL) provides a promising instructional approach to combat the challenges schools face in preparing students for the future by creating a student-centered approach focused on real-world application of knowledge and skills. PBL is defined as “…a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks” (Markham, Larmer, & Ravitz, 2003, p. 4). PBL teaches students the knowledge and skills to help them answer complex questions. When students are creating a product to demonstrate their answers, they are often collaborating in groups and learning “soft skills” such as flexibility, problem solving, leadership, professionalism and collaboration. These skills are often not
taught or used in a “tell-test” classroom that Pensky (2001) describes, but are needed in the current knowledge based economy (Trilling & Fidel, 2009).

Project-based learning is difficult for students to complete because it requires changes in the ways students learn and teachers instruct (Gulbahar & Tinmaz, 2006). For example, it presents unique challenges for students having to manage and create a project from a driving question with no “right” answer (Darling-Hammond et al., 2008; Frank & Barzilai, 2004; Marshall, Petrosino, & Martin, 2010). Moreover, many students believe it is the teacher’s role to motivate them and make learning interesting (Boekaerts & Niemivirta, 2000).

Despite these challenges that exist with PBL, self-regulation learning (SRL) is an extensively researched theory that teaches students how to set goals, monitor their progress and self-evaluate their work (Boekaerts & Corno, 2005; Schunk, 1990; Schunk & Zimmerman, 1997; Turner & Patrick, 2004; Winne, 2005; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1988). SRL is defined as self-generated thoughts by students using metacognition, by setting goals, and by being an active participant to direct their learning (Zimmerman, 1986; Zimmerman & Schunk, 2001). Although researchers in the field of project-based learning believe self-regulatory learning processes are already required parts of completing the project (Tassinari, 1996), there has been no explicit instruction used in any research studies. Students rarely receive instruction on self-regulatory skills and do not learn them on their own (Zimmerman, 2002).
Fortunately, self-regulation is teachable (Schunk & Zimmerman, 1998) and is learned through explicit instruction, personal experience and students’ own creation (Paris & Paris, 2001). A clear connection can be made between infusing SRL into a PBL unit to support student learning and motivation. Since self-regulation learning processes focus on procedural knowledge (e.g. learning the steps in the SRL cyclical model) and conditional knowledge (e.g. using the SRL procedure or strategy during a task), they can be infused into a project-based learning unit to support self-directed actions needed to answer the driving question and constructive investigation found in PBL. For example in a PBL unit, students often first ask a compelling question or explore ways to approach the driving question. This exploration often appears in a “need to know” list to help activate prior knowledge and elicit interest in exploring possible ways to approach the question or problem posed (Larmer & Mergendoller, 2010). In addition, students often gather and analyze information to explore how they will answer the driving question or begin to formulate a response. To support this step, students can utilize SRL strategies of goal-setting and planning to help direct their focus and efforts on the task. In PBL, students often create and need to synthesize information by completing research and this is when students’ implement SRL strategies to help them concentrate and monitor their progress. The next step in a PBL unit is to evaluate and revise their work. This relates to the SRL strategies of self-evaluation when students will judge their work toward a goal or external measure (e.g. rubric) and make revisions before publishing or sharing their work. Students’ reflection helps them to keep or revise their goals and strategies to finish the task. The self-regulatory strategy of self-reflection can also occur after the educational
event to decide what they did well and could improve or change for next time. By providing students self-regulatory skills, students can effectively manage their time, monitor their progress and persist through challenges toward meeting and exceeding project expectations while improving their self-efficacy and other attributes. The call for reform has been heard, the stakes for the nation and field of education could not be higher, and immediate action is paramount.

**Purpose of the Study**

Research has shown that Project-based learning (PBL) fosters problem-solving skills (Finkelstein, Hanson, Huang, Hirschman, & Huang, 2010; Mergendoller, Maxwell, & Bellisimo, 2006; Tretten & Zachariou, 1995), promotes college and career readiness (Dickinson & Summers, 2012), has resulted in high levels of student engagement (Gulbahar & Tinmaz, 2006) has resulted in an increase in content knowledge assessments, general achievement gains (Cognition and Technology Group at Vanderbilt, 1992) and deeper conceptual understanding (Baumgartner & Zabin, 2008; Grant, 2011; Grant & Branch, 2005; Schneider, Krajcik, Marx, & Soloway, 2002) compared to traditional methods of teaching (Boaler, 1999; Penuel & Means, 2000). In addition, students in PBL classrooms with low to average verbal ability with little prior knowledge on the subject have shown modest content knowledge gains compared to traditional classes focused on teacher-centered practices (Mergendoller et al., 2006; Mioduser & Betzer, 2003). It is important to note that when examining PBL comparison studies that there are a multitude of factors that may contribute to the findings including classroom and school climate, teacher facilitation skills, experiences and resources. For example,
Cheng, Lam, and Chan (2008) found group self-efficacy depended on the quality of the group’s adopted practices and another study found high school students had difficulty cooperating (Achilles & Hoover, 1996).

Research also demonstrates that students’ use of self-regulation learning (SRL) fosters a direct effect on their academic progress and skill development (Boekaerts & Corno, 2005; Schunk, 1990; Schunk & Zimmerman, 1997; Turner & Patrick, 2004; Winne, 2005; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1988). SRL plays an important role in PBL because it provides a framework to guide student motivation, manage work by selecting cognitive processes and revise and produce work through self-reflection. Yet, according to a review of the literature, self-regulation learning and project-based learning have not been combined to see the impact on student achievement and motivation. Therefore, the purpose of this dissertation study is to examine how infusing self-regulation learning processes into a 7th grade PBL unit can impact student learning related to self-efficacy, project artifact achievement and content knowledge. Another aim is to understand how students self-regulate in a project-based learning environment and to understand how high and low achieving students self-regulate in a SRL infused PBL environment.

Significance of the Study

This study is significant because to the researcher’s knowledge there are no studies where a project-based learning unit incorporates a self-regulation learning intervention to determine its impact on student achievement and motivation (Barron, 1998; Boaler et al., 1999; Cognitive and Technology Group at Vanderbilt, 1992; Gerlach,
Another reason why this study is significant is there has only been one study which examined self-regulation learning and project-based learning (Gerlach, 2008). The purpose of Gerlach’s study was to determine if project-based learning supports self-regulatory behavior in a middle school setting, but it did not evaluate achievement or motivational differences between PBL and PBL with SRL. This current study further extends Gerlach’s dissertation study in several ways. First, this study examines the direct impact of infusing self-regulation learning processes in PBL. Gerlach’s study examined whether PBL supports SRL. Although her study adapted part of Zimmerman’s social-cognitive perspective of SRL, she never explicitly taught lessons on self-regulation learning. Research supports that explicitly teaching self-regulation learning has a direct impact on academic achievement (Paris & Paris, 2001). Furthermore, self-regulation can be taught in a supportive and challenging environment (Boekaerts & Corno, 2005), the kind found in PBL classrooms.

The current study was designed using the Buck Institute for Education Project-based Learning Handbook, and focuses on teaching specific content standards which resembles the current educational focus on content, accountability and performance (Markham, Lamar, & Ravitz, 2003). With this increased focus on workplace readiness skills and preparing students for the future, (Carrier & Gunter, 2010; Partnership for 21st Century skills, 2006; Symposium on Workforce Readiness, 2007; The Conference Board,
2006), this study embeds the workplace standards of the Secretary’s Commission on Achieving Necessary Skills *What Work Requires of Schools* report (U.S. Department of Labor, 1991) and *Virginia’s Workplace Readiness Skills* report (Carrier & Gunter, 2010) to demonstrate how PBL can support teaching workplace readiness skills. In contrast, Gerlach’s study had students apply their own understanding of a specific unit and did not focus directly on what content was learned, but left it up to the students to decide.

The results of the present study could have a significant impact on the field of project-based learning and self-regulation by providing an understanding of how students self-regulate in a SRL infused PBL environment, but more importantly, provide insight into its potential to improve academic achievement and motivation.

**Definitions**

**Project artifact.** Creation of a product that demonstrates a student’s knowledge and understanding on a specific topic or driving question.

**Causal attribution.** Beliefs or reasons for the success or failure for their performance (Zimmerman, 2002).

**Content knowledge.** A term that represents the material students are expected to learn from a specific unit, in this case, economics. This is usually assessed in a test format.

**Goal setting.** The process of creating a plan to achieve a certain measurable performance (Pintrich & Schunk, 2002).
Knowledge economy. Using technological advancements to communicate, create, collaborate and innovate to produce goods and services (Trilling & Fadel, 2009).

Intrinsic interest. Students’ completing a task for its own value (Zimmerman, 2002).

Inquiry. The process where students seek knowledge by posing, investigating and answering questions for understanding (Justice, Rice, Warry, Inglis, Miller, & Sammon, 2007).

Metacognition. An ability to control one’s learning by understanding and reflecting upon it (Schraw & Denison, 1994).

Motivation. Desire to perform a specific action in a given situation (Schunk & Pintrich, 2008).

Project-based learning. “…a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks” (Markham, Larmer, & Ravitz, 2003, p. 4).

Project task. An assignment or a component of a project that leads to completion of the overall project goals.

Self-control. “The internal resources available to inhibit, override, or alter responses that may arise as a result of physiological processes, habit, learning, or the press of the situation” (Schmeichel & Baumeister, 2004, p.86).
**Self-efficacy.** The personal belief about the capability of performing an action or completing a specific task or desired behavior (Bandura, 2006).

**Self-regulation.** The degree that students are motivationally, metacognitively and behaviorally active participants in their learning process (Zimmerman, 1989).

**Self-regulation learning infused intervention.** During the PBL unit, the treatment group received an infused intervention that included Progress Feedback Forms used during class time (approximately once a week) and the three project artifact reflections. The teacher had the students keep out the SRL Resource handout during class, but did instruct them to use any specific SRL strategies.
CHAPTER TWO

This chapter provides a literature review of project-based learning and self-regulation learning. The first section focuses on project-based learning: Definition, challenges for teachers and students in implementing PBL, instructional support strategies and current empirical research. The second section discusses the social cognitive theory, Zimmerman and Moylan’s self-regulation learning model (2009), including the learning processes found in the forethought, performance and self-reflection phases. The last section addresses how self-regulation learning processes can be embedded into a project-based learning unit.

Project-based Learning

Background on project-based learning. Project-based learning (PBL) is not a new instructional approach in the field of education. The roots of project-based learning are found in the works of Dewey and Kilpatrick. Dewey espoused the “learning by doing” philosophy. Dewey’s educational belief was for students to learn and participate in classroom democracy. He denounced rote learning and authoritarian teaching and proclaimed that curriculum should be relevant to students’ lives and practical life skills should serve as the foundation for education (Dewey, 1899 excerpt reprinted in McDermott, 1981).
William Heard Kilpatrick (1918), a former professor at Teachers College, also wrote about a project and experienced based curriculum in an article entitled, *The Project Method* (1918). Kilpatrick stated that education is life and not a preparation for future activities. Similarly, Dewey (1933) believed in experiential education stating that education should build upon current experiences and help awake the natural interests of children.

Both theorists argued that students learn more when students take an active role in applying what they learned to something they experience and value. In the last few decades, the attempts to spread project and discovery learning approaches have not been successful in part because student motivation was often not considered (Blumenfeld et al., 1991). However, recently PBL has become much more popular because it resembles the environment that children experience and will face in this knowledge economy (Thomas, 2000).

**Characteristics of PBL.** There are five main characteristics that make PBL different from other instructional approaches (Thomas, 2000).

1. The projects must be based on the curriculum, and not an extension or enrichment activity.

2. PBL must be realistic, usually with a driving question or problem that students work to answer by creating a product to demonstrate their understanding.

3. PBL must involve constructive investigation. Constructive investigation has its roots in an inquiry based approach where students explore, search, research
and study ideas to work toward answering their interpretation of the driving question through their product.

4. PBL must be student-driven to a significant degree with the teacher helping to facilitate and guide students who may veer from the original goals of the unit.

5. PBL must be realistic and possible to implement outside of the school and resemble what adults could encounter in life.

In the education field, while some educators use project-based learning and problem-based learning interchangeably, other researchers identify clear differences. A distinct difference is that problem-based learning focuses on the process of inquiry and available tools and information to provide a solution to the problem rather than on producing a product (Kaine, 2003). In addition, there is no “typical” project that students will create because it is based on the students’ interest and talents but still must meet the content standards. Project-based examples can include a problem to solve (How can we make Broad Street safer for pedestrians?), a phenomenon to investigate (Why do 18 – 24 year olds vote the least?), a model to design (create a business product that middle school students will want to buy) or a decision to make (Should the school use recyclable trays?) (David, 2008). In summary, project-based learning focuses on problems and situations that students face in their life and work to understand and solve them by creating a project (Thomas, Mergendoller, & Michaelson, 1999). Project-based learning may or may not address a specific problem. In contrast, problem-based learning is an instructional model focused on both process and content that has students examine an ill-
structured problem that positions students to work to solve a given problem through a real world solution (Glazewski & Ertmer, 2010).

**Research on the characteristics of project-based learning.** Research and theories support the conclusion that the five PBL characteristics are an effective instructional approach to learning.

**Project is the content.** The main goal of PBL is that students acquire knowledge and skills through an inquiry process (Barron et al., 1998; Blumenfeld et al., 1991). Students create artifacts to reflect their understanding of the driving question or problem in the unit. In traditional classrooms, teachers may provide an extension project after students complete different activities. However, this does not reflect PBL because the project is not the focus or directing students to learn the curriculum.

**Driving question or problem.** The driving question or problem helps to create a realistic problem solving environment that helps to organize and focus activities (Blumenfeld et al., 1991; Markham, Larmer, & Ravitz, 2003). Marx and his colleagues (1997) explain three requirements for a driving question. First, it must focus on district and state standards. Second, the question needs to be reasonable for students to answer with the time and resources available, but also be one that can have many possible ways of being answered. Lastly, it must involve a real-world problem that is meaningful to students to motivate them to explore this issue in-depth.

**Constructive investigation.** Using the driving question as a guide, students analyzing the problem, design and conduct research, use existing resources or seek additional input from the greater community (e.g. interviews) and work to create a
product to demonstrate their understanding. During the investigation, teachers and classrooms play a vital role in the success of the project. In a longitudinal research study (Marx et al., 2004), Detroit public schools and the University of Michigan researchers implemented inquiry-based science classrooms for three years. They were interested in researching whether an inquiry-based and technology driven curriculum could help students in an underperforming urban school district. The 14 city schools participating ranged from inner-city to more suburban settings with an average of one to three teachers from each grade level participating. The sample size over the study was more than 8,000 students. The selected teachers for the study were similar to other Detroit teachers except they had taught for fewer years. They received professional development to teach the inquiry units. There were four units (6th grade had one, 7th grades had two and 8th grade had one) completed for the study. One of the 7th grade unit questions was “What is the quality of air in my community?” Researchers tested students’ knowledge by using content knowledge or science process skills using multiple choice or free response questions in a pretest and posttest format. The questions ranged from requiring lower level skills (recall) to higher level skills (application). To test reliability, Cronbach’s alpha was used and ranged from .63 to .78. The gains from pretest to posttest for each unit were statistically significant except for the water unit in 1998-1999. The total weighted average effect sizes for total scores increased over the three year study. The researchers noted the gains could have been partly due to students having inquiry experience from a previous year’s study in science and the teacher could have become more comfortable with the content.
**Realistic.** Steinberg (1998) claims “real enough” is when adults take it seriously, students see a reason for it and students can complete the project. It is not just a school project, but could be implemented in the real world. Another example of a realistic project is when outside evaluators or audience members provide feedback, they provide different ways for students to learn and communicate helping to enrich the experience (Barron et al., 1998).

Similar results were found in another study with teachers receiving Statewide Systematic Initiative (SSI) training in Ohio (Damnjanovic, 1998). The goal of the program was to provide content information, inquiry instruction and a system of support. The setting was eight urban middle schools in Ohio. Nine SSI teachers were randomly selected for the study and nine teachers who taught the same subject in the school without SSI training participated. The SSI students scored higher on science achievement tests and standards-based teaching practices. Students participating in the SSI study were found to have important correlates on the Discovery Inquiry test administered. The findings from both studies suggest that when teachers were given professional development, inquiry-based teaching can improve student achievement.

**Student driven (choice).** PBL is often characterized as highly motivating because student choice and interest are the cornerstone for success. Teachers facilitate this process by approving each step and by facilitating and directing students toward creating their end product, but not providing a specific plan for students (Mitchell, Foulger, Wetzel, & Rathkey, 2009). Allowing students to pursue their own interests using a wide range of tools and resources to research their problem or create a product which will help
them utilize their strengths and develop their interests, such as technology, acting or drawing. It is not enough to provide choices to students, but how the teacher provides choices and the number of choices are important.

Self-Determination Theory (SDT) is a relatively new field of study in psychology with its empirical theory being established in the 1980s. SDT can be defined as the process of “utilizing one’s will” (Patall, Harris, & Robinson, 2008). This theory relates to project-based learning because it examines the motivation behind the choices that people make without external influence and interference. In other words, SDT studies how much an individual’s behavior is self-motivated and self-determined (Deci & Ryan, 2002). An important component of SDT is intrinsic motivation. Intrinsic motivation in this paper is defined as starting an activity for its own sake because it is interesting and enjoyable in itself. In contrast, extrinsic motivation is completing a task because of an external force (Deci & Ryan, 2000). There are three intrinsic needs involved in self-determination that are considered universal, innate and psychological; they are competence, autonomy and relatedness (Deci & Ryan, 2002). Competence is defined as an individual’s ability to handle the environment in a way effective for the individual (Chang, 2012). Autonomy is defined as a person taking ownership of their own life and acting in harmony with their integrated self (Deci & Vansteenkiste, 2004). Relatedness means to be connected to and experience caring from others (Baumeister & Leary, 1995). When these three intrinsic needs (competence, autonomy and relatedness) are met, motivation will be enhanced. When students in the environment have little control, self-determination and intrinsic motivation are lower (Deci, Connell, & Ryan, 1989).
Self-Determination Theory explains that the ability to choose should be a positive motivation and performance outcome (Deci & Ryan, 2000). People will be more intrinsically motivated to persist at a task if it involves their personal choice and opportunities to make choices (Deci & Ryan, 2000). A study that had one group of participants choose three out of six puzzles persisted longer at the task compared to the group that were assigned three out of the six puzzles (Zuckerman, Porac, Lathin, Smith, & Deci 1978). However, there are studies that suggest the self-determination model has no effect on choice, motivation, or performance-related outcomes (Parker & Lepper, 1992; Reeve, Nix, & Hamm, 2003). Another study found little or no effect on engagement or task performance when students were given a choice whether to work on a crossword puzzle or an essay assignment (Flowerday & Schraw, 2003). Two other studies found that no-choice participants had higher quality essays compared to students with choice. Furthermore, choice had no impact on a subsequent test to assess what was learned (Flowerday, Schraw, & Stevens, 2004). Some psychologists believe that choice can lead to ego-depletion, which means that students experience a decrease in the ability to start an activity, to make choices or to self-regulate (Patall, Harris, & Robinson, 2008).

In response to these mixed results, Moller, Deci, and Ryan (2006) claim that there is a distinction between a choice that allows for students’ autonomy and a choice that is restricted based on a teacher’s actions. Moreover, research suggests that the ego-deleted cases showed a controlled choice. In other words, students are stated to be given a choice, but are pressured to select a choice from an established list of options (Moller et al., 2006). These studies help to establish that giving student choice is complicated and
not an automatically beneficial process. However, Moller et al. (2006) work shows the PBL teachers need to provide a choice that allows for students’ autonomy, but help the student focus on a few choices instead of several.

**Research on project-based learning.** Project-based learning’s empirical evidence demonstrates its impact on student achievement, motivation and other processes (Barron et al., 1998; Boaler, 1999; Cognitive and Technology Group at Vanderbilt, 1992; Penuel & Means, 1999).

Project-based learning has shown an improvement in achievement, real-world application and problem-solving skills compared to traditional teacher directed classrooms. Boaler (1999) conducted a three year longitudinal study on two British schools (referred to as the textbook or project school). The study used an experimental design by employing a pre-and-post design using a criterion measure (national exam) for both the experimental and control groups. The participants were a cohort of students from each school (300 students in all) as they moved from Year nine (age 13) to Year eleven (age 16) during the study with comparable backgrounds and performances. The textbook school focused on whole group instruction and textbook teaching where Boaler explains they learned procedural knowledge focusing on formalized rules and procedures. In contrast, the project school focused on a project-based model with a range of activities and teaching methods. The findings illustrated that students at the textbook school had difficulties finding the real world application and 64% of them reported that math was more about memorizing than thinking compared with only 35% at the project school. The results demonstrate that the project school earned higher grades on the national exam
because students developed a different kind of knowledge but did not necessarily learn more. Similar findings were revealed in the Challenge 2000 Multimedia Project (Penuel & Means, 1999). The five year goal was to infuse outstanding project-based learning supported by multimedia in the Silicon Valley schools. In year four, the researchers at SRI International Center for Technology in Learning measured performance assessment task on a pencil-and-paper brochure identifying ways to help homeless children do well at school. Similar to other studies, the mean scores of all three aspects showed that Multimedia project students scored much higher than the comparison group (Penuel, Korback, Yarnall, & Paepaco, 2001).

Project-based learning has also been linked to increases in student problem-solving skills and to student motivation. Barron and researchers (1998) from the Learning Technology Center at Vanderbilt University conducted a research study with five fifth grade classes that included 111 students in the same middle school near Nashville, TN. Although there was no comparison group, the five week study measured student learning by designing-a-chair task, taking a geometry test and completing a collaborative playhouse design. Results demonstrated significant growth in knowledge and problem solving skills. After the students had experienced PBL, researchers wanted to see if students could transfer their problem-solving skills to a new task. For example, an outside reviewer examined the design-a-chair task to determine whether the design was a pre or post-test design. The reviewer had a 97% accuracy demonstrating that most students improved in their ability to problem solve to create a design. In another study conducted by the Cognitive and Technology Group at Vanderbilt (1992), the researchers
created the technology-based Jasper Series. The intervention was designed to help students develop complex problem-solving and reasoning skills by watching 15-20 minute videos and working to solve complex problems with no clear solution. Although the study demonstrated that the control and experimental groups were found to improve at the same rate on basic math concepts, Jasper groups performed much higher on one-step, two-step and multistep word problems. Jasper students showed improved attitudes as compared to the control group on four of the five attitudes toward math scales and teachers commented on the excitement that students showed toward the videos. These studies demonstrate that PBL helps to develop problem-solving skills and motivation, which are not always easily measured in schools.

Project-based learning provides some evidence that students gain in knowledge, problem-solving and motivation as demonstrated in the summary of studies. Overall, the results vary depending on the design, implementation of the study and PBL model used. The individual PBL characteristics that comprise the instructional approach provide empirical evidence, but further research is needed on specific PBL environments and units.

**Challenges for teachers.** PBL is known to be challenging for teachers to implement in their classrooms (Blumenfeld, Krajcik, Marx & Soloway, 1994; David, 2008; Marx et al., 1994; Marx, Blumenfeld, Krajcik, & Soloway, 1997). Moreover, research studies that have been implemented are usually well-developed units or programs, not individual teachers (David, 2008). Three major challenges which can inhibit successfully implementing PBL are time, teacher beliefs and project design.
**Time.** Teachers are under enormous pressure to increase pass rates on state tests and cover the curriculum (Marx et al., 1994, 1997). PBL can take more time for students to learn because they are discussing, conducting research, reevaluating and making revisions to their work. For example, Toolin (2004) studied PBL implementation with six middle and high school teachers in New York City. Despite being provided one hour of professional development and resources per week, two teachers did not embrace any elements of PBL due to focusing on teaching to the state tests and having little teaching experience.

**Teachers’ beliefs.** Another common problem for teachers is that inquiry and student-centered approaches can go against their beliefs or cause chaos. Teacher beliefs are defined as unconsciously held assumptions about instructional and curriculum practices (Pajares, 1992). Teachers’ education beliefs shape their instructional practices, but classroom limitations (time and resources) can hinder how they put these beliefs into action (Pajares, 1992). Another challenge many teachers face is the balance between student autonomy and class “control” (Blumenfeld et al., 1991; Ladewski, Krajcik, & Harvey, 1994). Too little, or too much, freedom can hinder student motivation and cause classroom management problems for the teacher (Marx et al., 1997).

**Project design.** Projects must be well-planned and adjustments must be made throughout the unit. Without careful monitoring throughout the unit and a well written driving question, the purpose of the unit can be lost (David, 2008). For example, a 6th grade project in Nashville focused on having students build and launch a rocket for their “Mission to Mars” project. Despite the student-centered environment and collaboration,
students missed the main goals of the unit. They could not explain the factors that went into making a successful or unsuccessful rocket (Petrosino, 1995). A later study revealed that providing learning goals or overarching questions to explore helped students reflect and learn how to decide the best design for their rockets, compared to other classes that did not have the questions (Petrosino, 1995).

**Challenges for students.** Project-based learning puts the ownership and responsibility on students to create and demonstrate their understanding of a problem or driving question. This can be especially difficult when students must be actively engaged for several weeks on a project (Blumenfeld et al., 1991), and they are used to teacher-centered classrooms. Students can demonstrate many challenges and reactions toward more challenging work. Some challenges for students are that they do not change their approach to learning when faced with higher level thinking tasks. They are resistant and work to simplify the tasks (Blumenfeld et al., 1991). For example, fifth and sixth grade math students in one study examined, “What makes a kite aerodynamic?” One student, Adam, preferred difficult tasks in his survey, but during the interview looked to do minimal work and to simplify the project by explaining that the project was not difficult because of the help from his mother (Meyer, Turner, & Spencer, 1997). When prompted to explain what he would do without parent involvement, he mentioned buying a kite from the store. This example illustrates some students may try to find ways to get around challenging tasks because of a lack of motivation or interest.

Another challenge expressed in the literature is students need to have practice and a level of proficiency in cognitive and metacognitive skills to manage complex tasks.
PBL requires students to plan, make, and test predictions to eventually find a solution to the question or problem. This requires students to use cognitive strategies to think through the process they are using and to make adjustments. Students who lack the necessary practice to think and use metacognitive skills will likely struggle without proper teacher support.

**Instructional approaches to help support PBL.** Despite the challenges for teachers and students, PBL has been successfully implemented in classrooms and schools. Researchers and veteran PBL teachers have found scaffolding, formative assessments and time management are crucial for successful implementation. This section will examine how to apply best practice strategies to improve implementation of PBL.

**Scaffolding.** Project-based learning has been criticized for having students focus on projects rather than learning processes and not providing guidance and support to complete the projects (Kuhlthau, Maniotes, & Caspari, 2007). However, scaffolding has been shown to be an effective strategy in helping students’ complete complex tasks (Holton & Clarke, 2006). Scaffolding is defined as “…a process that enables a child to solve a problem, carry out a task, or achieve a goal which would be beyond the child’s unassisted efforts” (Wood, Bruner, & Ross, 1976, p. 90). The theory behind scaffolding is Vygotsky’s zone of proximal development (ZPD). ZPD states that the most productive learning occurs when the task is not too easy or impossible, but where children can achieve it if assisted by a more knowledgeable and competent peer (Vygotsky, 1978). According to Wood et al. (1976), there are six main functions of scaffolding:
1. Recruitment – engaging students in a task
2. Reduction – creating smaller parts to complete a larger task
3. Maintenance – helping the student to maintain focus
4. Marking – emphasizing the main part of the lesson or activity
5. Control – reducing the difficulty level of the activity
6. Demonstration – providing a model of the project or task for the child to work toward completing

Scaffolding is not a closed activity (e.g., a teacher explaining an answer), but suggests some further action. For example, scaffolding is used to help students complete a task by creating smaller parts or focus on understanding the main part of the activity. Therefore, scaffolding usually leads to further studying of a topic or working to solve a problem (Holton & Clarke, 2006). Moreover, it usually leads to a gradual release of support from the teacher or peer until the person can complete the work independently. In a PBL setting, scaffolding occurs at a whole class level by helping students create a “need to know” section in the room or in their notebook based on the driving question. In addition, many PBL units have sub-questions to help students focus their work and move toward answering the driving question.

**Formative assessments.** Formative assessments are vital for student success in project-based learning because they provide opportunities for students to self-evaluate and allow teachers to monitor student progress. In other words, they allow students to understand what they have accomplished and what they still need to do. However, many teachers do not change their teaching to help students until the end (Barron et al., 1998).
In *Ethics of Excellence*, Berger (2003) proclaims that teachers need to structure the project in a way that it makes it difficult for students to fall far behind or fail. The checkpoints or indicators of student progress need to be clear for both the student and teacher. Similarly, Sadler (1989) has identified three major components that are necessary for successfully implementing formative assessments. First, students need to share a similar expectation with the teacher regarding the quality of work. They also need to be able to compare their current progress with the standard they are being assessed (e.g. rubric), and they must take action to remedy the differences between their current progress and final product. Similar to scaffolding, formative assessments can help students develop cognitive skills and motivation (Shepard, 2005).

**Time management strategies.** Using time effectively is difficult for both students and teachers especially in a project-based learning environment that is often different than how teachers were taught in their educational courses (Marx et al., 1994). Despite these obstacles, it is the role of the teacher to use effective planning in both unit design, fostering a learning environment that helps students learn to use their time effectively and reduce possible barriers from issues that arise outside the classroom. To help promote effective time management strategies, researchers interviewed 12 expert PBL practitioners about strategies to increase project successes (Thomas, Mergendoller, & Michaelson, 1999). One of the major themes that developed was four suggestions for time management. First, when planning a PBL unit, set a specific number of days, but also build in up to 20% more time. Second, the PBL experts suggested introducing the project ahead of the unit to let students think about how they can approach the driving
question or problem. This strategy can help save time and provide time for students to complete initial research and talk to others. The third suggestion was to coordinate major deadlines between and within other classes to reduce the amount of overlapping deadlines. The last suggestion was to provide alternative instruction when behavior or academic concerns begin to develop. These suggestions can minimize outside influences on the PBL unit.

**Social Cognitive Theory**

Bandura’s social cognitive theory (1986) will serve as the foundation for the self-regulation learning theory that will be used in this study. Bandura’s theory focuses on three human functions: cognitive, behavioral and environmental factors interacting with each other to create a triadic reciprocality. In other words, one factor (environment) can change students’ behavior and cognition, which has implications for future decisions.

For example, a learner who scores poorly on a social studies test despite rewriting his notes (cognition) in a noisy gym (environment) will most likely change his behavior if he is self-regulated to change the outcome. An important construct of Bandura’s is perceived self-efficacy, which means a learner’s belief about his or her capabilities to learn or perform at certain levels. Research has shown that self-efficacy beliefs impact a learner’s selection of tasks, persistence, effort and achievement (Bandura, 2004; Pajares, 1996; Pajares, 2006). A result from the example above is that a student’s behavior will change their efficacy beliefs (Schunk, 1995). For example, a self-regulated learner will change his or her behavior of studying in a noisy gym (environment) and possibly his study strategy (cognition). The learner who is not self-regulated will most likely have
lower self-efficacy and study less, which will impact persistence in reaching his goal on an upcoming test. This example also shows how the interaction between the three events can have a positive or negative outcome based on a learner’s self-efficacy.

The social cognitive theory differs from other theories by focusing on behavioral consequences as a means for providing information and motivation. This view posits that humans are active and self-directed and can self-reflect and self-regulate themselves. People choose to use learning strategies and skills in which they see value and the probability of positive results. In the example above, if the learner scored well on the history test, the student will most likely be motivated to use the same learning strategy again, if he believes it helped him achieve his goal.

**Self-Regulation Learning**

The question “How can students become masters of their own learning processes?” has been at the forefront of the self-regulation learning (SRL) research for more than three decades. In other words, researchers have wanted to understand how students can direct their actions and beliefs to use their mental abilities in order to perform an academic skill and improve achievement (Zimmerman, 2002). In the 1970s and 1980s, researchers focused on non-experimental studies to demonstrate the positive impact that self-regulatory processes have on students learning. However, the results of the studies were rarely applied outside the non-experimental context (Pressley & McCormick, 1995). A turning point in the field occurred at the 1985 American Education Research Association (AERA) symposium. It provided an encompassing definition for SRL focusing on three aspects: metacognition, motivation and students
being active participants in their learning (Zimmerman, 1986; Zimmerman & Schunk, 2001). The first term metacognition is the self-awareness of being able to explain what is known and not known about a task and the understanding of what action must be taking to reach the goal (Schraw & Denison, 1994). The second term motivation is defined in this paper as the desire to perform a specific action in a given situation (Schunk, Pintrich, & Meece, 2008). The last important concept is “behaviorally active” which means that teachers do not pour knowledge into students as if they were passive empty vessels, but something students actively “do” to understand the content. Another way of viewing self-regulation is that a learner must have the skill, which means the strategies to complete a task and the will, which means the interest and motivation to complete it (Montalvo & Torres, 2004).

Self-regulation learning is a complex and multifaceted approach that is not a single step or trait, but it includes aspects such as planning, setting goals, using selective strategies to achieve one’s goals, self-monitoring progress, adjusting goals or environment as needed, and self-evaluating and attribution causation to the results (Zimmerman, 2002). Several research studies in diverse settings have shown that students’ use of SRL has a direct effect on their academic progress and skill development (Boekaerts & Corno, 2005; Schunk, 1990; Schunk & Zimmerman, 1997; Turner & Patrick, 2004; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1988). There are several self-regulation learning models, but this paper will focus on Zimmerman’s social-cognitive perspective of SRL model because of its clear overlap with project-based learning.
Barry Zimmerman, a Professor Emeritus of Educational Psychology at the University Center of the City University of New York (CUNY), has served as one of the pioneer researchers in self-regulation learning for several decades, publishing more than two hundred articles on the topic. The foundation for Zimmerman’s social-cognitive perspective of SRL (2000) is based on Bandura’s social cognitive theory (1986, 1997, 2002). More recently, Zimmerman and Moylan (2009) have expanded to provide additional details about the processes in the three phases and this updated diagram was used for the study (Figure 1).

**Figure 1.** SRL diagram adapted from Zimmerman and Moylan (2009) © Routledge
The model provides a dynamic interaction for students to continue to monitor, revise and reflect on the learning process.

**Forethought.** Forethought is the first phase in the model and it focuses on the motivational processes that set the stages for learning. The two main forethought processes are task analysis and self-motivation beliefs. Task analysis includes goal setting and strategic planning which help a learner create a plan (goal) that is proximal (specific, realistic and timely). Self-motivational beliefs are self-efficacy, intrinsic interest and learning goal orientation which all help relate to students’ beliefs about the learning experience and environment.

**Goal setting.** Goal setting is defined as the process of creating a plan to achieve a certain measurable performance (Pintrich & Schunk, 2002). Research has shown that effective goals are specific, measurable and time sensitive objectives (Locke & Latham, 1990). Moreover, Locke and Latham (2002) state that goal setting theory is one of the most valid theories of motivation. For instance, setting specific difficult goals has been shown to lead to higher motivation (e.g. effort and persistence) and performance in over 100 studies with more than 40,000 participants in at least eight countries. According to Locke and Latham (1990), the effect sizes for the meta-analyses studies ranged from .42 to .80. The dependent variables in experimental labs and field studies have included time, quality, and quantity with the time span of the studies ranging from one minute to a longitudinal study of 25 years (Locke & Latham, 2002). Goal setting has significant implications for students’ self-regulatory skills. A cyclical effect occurs when students
set appropriate goals because it improves their commitment to finishing a task which also influences their performance and self-efficacy perceptions (Zimmerman & Cleary, 2006).

It is important to note that setting goals does not mean better performance or increased self-regulation. The goals cannot be broad, but must be linked to a performance standard and must not be too easy, but not impossible (Schunk, 2001a). Students who set proximal (short-term) goals instead of distal (long-term) goals can show their progress in a tangible way, are more efficacious, and increase skill development (Bandura & Schunk, 1981; Schunk, 1983). One popular method of teaching goals is to use SMART goals: S – Specific, M – Measurable, A – Attainable, R – Realistic, and T – timely (Doran, 1981). The SMART goal aligns well with the research on creating a specific, measurable and timely goal (Locke & Latham, 1990). However, goal setting is not enough by itself because Zimmerman and Moylan’s model also focuses on the performance phase (completing the task) and self-reflection phase (revising work and goals). By providing SMART goals throughout the project, students can begin to monitor their actions by evaluating their work on continual basis and make necessary changes to goals. It is important to provide multiple goals throughout the unit. Students need to understand that their successes and failures are not based on only one goal (Ford, 1995).

**Goal orientation.** Goal achievement theory examines the purpose or reason students pursue an achievement task and how they evaluate their success on it (Pintrich, 2000). There are various terms used to describe the types of motivation, such as task-involving vs. ego-involving (Newton & Duba, 1999) and process and outcome goals
For the purpose of this paper, mastery and performance goals will be used (Ames & Archer, 1988).

Mastery goals are focused on developing personal growth and acquisition of new skills or demonstrating competence on a task (Kaplan & Maehr, 2007). Moreover, mastery goals are characterized by a positive set of processes and outcomes such as persistence when faced with challenges, deep processing of strategies and self-regulatory skills and task satisfaction (Elliot, 1999). In contrast, performance goals are focused on a student’s ability and demonstrating competence to avoid the impression of not succeeding (Elliot & Dweck, 2007). Performance goals are often characterized by a negative set of processes and outcomes such as surface processing of information and use of strategies and a lack of persistence to overcome challenges (Elliot, 1999). However, research studies have resulted in mixed results for demonstrating the impact of performance goals (Ames, 1992). In response, Elliot (1999) separated performance goals into two separate categories labeled performance-avoidance and performance-approach. Performance-avoidance is focused on not demonstrating low ability or incompetence. It is associated with negative outcomes (Elliot, 1999) including a fear of failure and a belief in fixed intelligence, which can lead to evaluative anxiety. In contrast, performance-approach is when a person demonstrates high ability in relation to others and it has been demonstrated with positive traits as effort and persistence, but connected to superficial understanding of material (Fryer & Elliot, 2008).

Zimmerman and Kitsantas’ (1997, 1999) studies further supported and added to the research on goal orientation. Zimmerman and Kitsantas (1999) examined two groups
of high school students who took different goal orientations when completing revisions on a writing task. When novice student learners focused on performance goals, they were taught to combine several basic sentences into a more complex sentence. During the session, the mastery goal group focused on using the revision process they were taught while the performance goal group focused on the outcome of combining several basic sentences into a more complex sentence. The results demonstrated that the mastery group scored higher than the performance group. The research illustrated that focusing on outcomes before acquiring the necessary processes to complete the task can lead to poorly adaptive practices that hamper student learning. It is recommended that novice learners model and imitate processes taught to complete complex tasks before moving to a performance goal orientation (Zimmerman & Kitsantas, 1997). It is important to note that the teacher needs to help foster an environment that is optimal for student performance by creating a goal orientation that moves from process (focused on mastery of steps) to performance (focused on results). Research has shown that student performance is highest when students use mastery to performance goals (Zimmerman & Kitsantas, 1997). In summary, teaching goal setting as a learning strategy can improve motivation and impact performance positively, but it can depend on the orientation of goals (Cleary & Zimmerman, 2001).

**Self-efficacy.** Self-efficacy is an important self-motivational process in the forethought phase because it is “…rooted in the core belief that one has the power to effect change by one’s actions” (Bandura, 2004, p. 622). Self-efficacy is defined as personal belief about the capability of performing an action or completing a specific task.
or desired behavior (Bandura, 2006a). Since Bandura’s (1977) publication of “Self-Efficacy: Toward a Unifying Theory of Behavior Change”, over 3,000 studies have included the concept of self-efficacy in a variety of fields (Pajares, 2006).

Self-efficacy is domain-specific, context, and task-specific (Zimmerman & Cleary, 2006). This means that if someone is highly efficacious in math computation, it does not equate to necessarily being efficacious in math word problems. For instance, a student may experience a lower self-efficacy in a competitive environment than in a collaborative or mastery-oriented classroom (Bandura, 1986, 1989; Pintrich & Schunk, 2002). Self-efficacy has a significant impact in the classroom. Pajares (2006) found that self-efficacy explains 25% of the variance in the prediction of academic performance.

Self-efficacy for learning plays an important role in being a self-regulated learner (Schunk & Usher, 2011). For example, self-efficacy determines what people will do with the knowledge and skills they possess (Pajares, 2006). Moreover, self-efficacy impacts the amount of effort that students use in self-directed learning, persistence and strategies toward a task (Zimmerman, 2002). Students who exhibit high self-efficacy toward a task approach a challenge as something to be accomplished instead of something to fear, have high goals, demonstrate persistence and resilience (Bandura, 1997) and put forth more effort regardless of ability and achievement (Pajares, 2003; Usher & Pajares, 2008). Yet, students who do not believe they are capable of completing a task will use little effort or persistence toward completing it (Bandura, 2004; Pajares, 1996, 2006). To clarify, self-efficacy has a direct impact on the creation of goals, goal commitment, response to feedback and performance (Locke & Latham, 1990). This demonstrates that it is not
necessarily how capable you are at a task as much as how much you believe you are capable (Pajares, 2006).

Research has shown that there are four major sources of self-efficacy. Self-efficacy beliefs are shown not to be static, but rather can be influenced by student outcomes (behaviors or achievement) and others (teacher feedback and peer relations). The most influential source for enhancing perceptions of personal efficacy is mastery experiences. These are experiences where the student is personally involved in an accomplishment. Research has demonstrated that these experiences increase one’s self-efficacy (Schunk, 1981; Schunk & Schwartz, 1993; Zimmerman & Kitsantas, 1996). The second source is modeling or vicarious experiences. Modeling refers to behavioral, cognitive and affective changes that occur from observing others perform a behavior (Pintrich & Schunk, 2002). There are two types of models that can be used in classrooms. Coping model is when a person struggles through a problem until they reach a successful conclusion. In contrast, the mastery model is when the person masks challenges or mistakes as though they never occurred. Schunk (1995) found that coping models are more likely to increase student self-efficacy than mastery models. In a classroom, this can be observed through social comparison where students see that similar classmates were able to complete a task and students form the belief that if others can do it, I can do it as well (Bandura, 1997). Therefore, the impact on self-efficacy beliefs will be strongest when the student sees that someone similar in age and ability was able to do a task. The next source is social persuasion where students are exposed to peers, teachers and others who help form their perceptions of personal capabilities. In a
classroom, this can be demonstrated by a teacher incorporating strategy use when providing feedback on a specific performance. This action can make long-term changes in students’ self-efficacy beliefs and attention to learning processes. The last source of self-efficacy is physiological reactions where students interpret their personal competence under various situations. For instance, self-efficacy can be changed through improving physical status, reducing negative emotions and lowering stress levels (Bandura, 1997). Although these four sources of self-efficacy are important information, they do not automatically change self-efficacy beliefs (Schunk & Pajares, 2009). Students’ interpretation of their results and judgments help to shape their beliefs. Therefore, self-efficacy plays an integral role even before students begin a task.

**Self-efficacy research.** Research has shown that self-efficacy is a predictor of performance and learning across subject areas. Zimmerman, Bandura, and Martinez-Pons (1992) found that 9th and 10th grade social studies students’ (n = 102) perceived self-efficacy for self-regulated learning contributed significantly to their efficacy for academic achievement (r = .51). In addition, perceived self-efficacy for academic achievement predicted their final grades in social studies (r = .52). Results demonstrate that perceived academic self-efficacy and personal goal setting resulted in 31% of the variance in academic achievement. Zimmerman and Bandura (1994) conducted a study with 95 college students in a writing course. Similarly, 35% of the variance in academic achievement resulted from perceived self-efficacy and personal goal setting. The perceived academic self-efficacy impacted writing achievement and perceived academic...
self-efficacy on final grades were $p = .38, p < .05$. Both studies illustrate that self-efficacy is significantly related to achievement.

A longitudinal study (Caprara et al., 2008) examined the impact perceived self-regulatory efficacy has on a student academically. The study examined 412 Italian students (48% male and 52% female) from age 12 (T1) until 18 (T5). After controlling for prior achievement, the findings revealed that students with higher self-regulatory efficacy at age 12 had higher grades at the end of high school. Although self-regulatory efficacy decline in general as students became older (Caprara et al., 2008; Pajares & Valiante, 2002; Usher & Pajares, 2008), it decreased less with students who had high self-regulatory efficacy. Similarly, T1 students with higher self-regulatory efficacy were less likely to drop out of high school. Both studies demonstrate the impact that self-regulatory efficacy had on performance and learning (Caprara et al., 2008). In conclusion, Zimmerman (2002) notes all learners self-regulate, but in different ways and self-beliefs. Self-efficacy helps to promote SRL by helping students believe they are capable of managing their own learning which in turn influences the SRL processes they utilize.

**Performance.** Once the students have the motivational processes and plan (goal) to achieve the task, the student must take action in the performance phase which includes the two major processes of self-observation and self-control.

**Self-observation.** Self-observation has two subprocesses that include self-recording and metacognitive self-monitoring. Self-recording is writing down the processes and/or outcomes of one’s actions (Cleary, Zimmerman, & Keating, 2006).
Recording one’s progress often includes graphing and logs that record information or progress toward a goal that helps students track their progress and make necessary changes (Cleary & Zimmerman, 2004).

The other subprocess of self-observation is metacognitive self-monitoring. For the purpose of this paper, the terms metacognition and self-monitoring will be defined separately and then discussed together. Metacognition is defined as an ability to control one’s learning by understanding and reflecting upon it (Schraw & Denison, 1994). This definition is worth examining in more detail because it relates to Flavell’s (1979) two distinct areas of metacognition: Metacognitive knowledge and metacognitive regulation. Metacognitive knowledge can be broken into three types. The first is awareness of knowledge, what is known and not known and what one wants to know. The second is awareness of thinking which includes understanding cognitive tasks and what is required to finish them. Lastly, there needs to be an awareness of thinking strategies in order to direct action to meet a desired goal. Metacognitive regulation relates to the knowledge component because it helps to manage one’s own thinking and keep the person focused on the task.

The other key aspect is monitoring which plays a central role in self-regulated learning (Huff & Nietfeld, 2009). Monitoring is when the student assesses his or her progress compared to a learning goal and generates internal feedback that contributes to the learner’s regulation and future action (Butler & Winne, 1995). SRL students use internal and external feedback to inform their progress toward their goals, strategies and toward their outcomes (e.g. completion of the task). Self-monitoring usually occurs in
two ways. First, a student can observe his or her progress by recording whether the task has been completed or not. To ensure monitoring, students must understand the task and an explanation of the evaluating criteria. The second way is a student can observe and record his or her behaviors compared to the current action and determine if it promotes or hinders meeting the goal or desired outcome (Belfiore & Hornyak, 1998). Research has also demonstrated that self-monitoring and goal setting are important for improvement. Zimmerman and Kitsantas (1997) conducted an intervention with high school girls ($n = 90$) who were novices at throwing darts. The results illustrate that the self-recording experimental groups in all goal categories exceeded the performance of students who did not self-record their work including students who created process and product goals. Similar findings (Lan, 2010) were revealed in an experiment with graduate students in a statics course ($n = 72$). Students were assigned to either a self-monitoring group, instructor-monitoring group, or a control group to investigate motivational and course performance differences. The self-monitoring groups outperformed the other two groups on the four class examinations, but no motivational differences were found. One possible explanation offered was that all students were motivated to learn because they valued the course for their educational aspirations. Research has demonstrated that self-recording can be an important role in learning and motivation (Zimmerman, 1989).

There has been a growing concern among researchers about accuracies in students’ self-awareness and self-evaluation (Bol & Hacker, 2001; Koriat, 1997). Calibration is defined as the comparison between the confidence and actual accuracy of performance, which focuses on how self-aware individuals are of what they know.
Miscalibration is a significant concern because in order for students to self-regulate, they need to have an accurate view of how they learn (Labuhn, Zimmerman, & Hasselhorn, 2010). The efforts to detect miscalibration have been mixed (Bol, Hacker, O’Shea, & Allen, 2005).

One promising tool that has been used to help students more accurately monitor their progress is graphing (Cleary, Platten, & Nelson, 2008; Cleary & Zimmerman, 2004). Kitsantas and Zimmerman (2006) conducted a study of 70 college students to examine how self-evaluative standards inform learning within a cycle of SRL. The students were randomly assigned to five groups: control group, absolute standards without and with graphing, graduated standard with and without graphing. In this study, the absolute standards meant either success or failure receiving seven points for a bull’s eye or zero for hitting any other area. The graduated standards focused on approximations, meaning that a person would get at least one point for hitting the target and the score would increase as it got closer to the bull’s eye. The graphing group with graduated feedback had the highest dart skill ($M = 29.86$), self-satisfaction ($M = 83.57$), self-evaluation ($M = 82.86$) and self-efficacy ($M = 83.57$). The control group and the absolute feedback with no graphing had the lowest dart throwing skills, self-satisfaction, self-evaluation and self-efficacy. The results demonstrated that students who graphed their performance showed higher level of skill and self-efficacy than those that did not graph. Lastly, the graduated standards had higher levels of self-satisfaction than absolute standards in both graphing and non-graphing groups. Self-recording and self-evaluation standards demonstrated improved skill and ultimately, motivation.
The other process in the performance phase is self-control. It is defined as “the internal resources available to inhibit, override, or alter responses that may arise as a result of physiological processes, habit, learning, or the press of the situation” (Schmeichel & Baumeister, 2004, p. 86). This refers to implementing the specific strategies that were selected in the forethought phase, which could include task strategies, imagery, self-instruction and attention focusing strategies.

One important self-control process is self-verbalization or self-instruction. Research supports that high-achieving students use more self-verbalization of strategies than their peers (Biemiller, Shany, Inglis, & Meichenbaum, 1998). In a study by Schunk and Cox (1986), they found that students who had the highest self-efficacy and achievement were the group of students who used continuous verbalization compared to the groups that used none or verbalization only part of the time. Teachers can help model this process by using a think aloud technique when teaching a new concept or when students are faced with a challenging problem or question. For example, teachers can model the way to approach the problem or question and different strategies to work on it. After modeling and practice using this skill, students need to individually practice self-verbalization by talking through the problem aloud or in their head or in small groups.

Self-reflection. There are two major components to self-reflection: self-judgment and self-reaction. One important form of self-judgment is self-evaluation which is comparing self-observed performance to a standard, such as a rubric or previous performance (Zimmerman, 2002). Schunk (1996) conducted a study investigating the impact SRL and achievement outcomes had on the use of goals and self-evaluation. He
studied children who were taught fractions by use of direct instruction and self-directed practices. Some students were given the learning goal with or without self-evaluation while some were given the performance goal with self-evaluation. The results showed that the groups that used self-evaluation had higher skills, motivation and self-efficacy. This study helps to illustrate the importance of continuous self-evaluation. However, it is important to state that students must have time to practice strategies independently to internalize them and incorporate them daily (Zimmerman, 1998). It takes significant time for many students to learn to self-evaluate because it does not happen automatically (Schunk, 2001b). The teacher must incorporate a significant amount of modeling, practice and self-regulation strategies (e.g. self-verbalizing) for students to become reflective and be able to fairly evaluate their work.

Another key process in self-judgment is casual attribution. Casual attributions are the beliefs or reasons for the success or failure for performance (Zimmerman, 2002). According to Frieze (1976), learners attribute their success or failure to four factors: native ability, effort, luck and task difficulty. Weiner’s (1979) research added that the four attributions are based on a continuum of causal dimensions including locus of control, stability and controllability. Locus of control is focused on the location of the cause whether it is internal or external to the learner. For example, an internal locus of control is native ability and effort because the source of the outcome is within the individual. For example, a learner who does well may attribute the success to ability or extra effort. Whereas if the learner perceives the outcome to be an external control (e.g. luck and task difficulty), they will believe it cannot necessarily be changed or success is
by luck. Therefore, attributing success to internal locus increases self-esteem, but an attribution of failure can result in embarrassment or lack of effort.

The second causal dimension is stability, which refers to whether the event or the reason for the outcome is stable or unpredictable over time. For instance, when learners attribute a successful outcome to stable factors, they experience positive beliefs about future outcomes. However, if the learner attributes failure to a stable outcome, such as a lack of ability to do well in a subject, it could lead to lower expectations (Hunter & Barker, 1987).

Controllability is the final dimension and it refers to whether a learner perceives they can affect the outcome or if it is out of their control (Hunter & Barker, 1987). When a positive causal attribution occurs, learners believe they can achieve at higher levels through more effort and become more motivated to do so. In contrast, students who perceive the outcome to be uncontrollable will exert less effort. A learners’ perception of the three dimensions of causes impacts the future steps a student takes toward the task.

Cortes-Suarez and Sandiford (2008) used an experimental design and self-report survey to examine the results of 410 participants ($N = 410$) in a college algebra course. Those who scored a 75% or higher on the test ($n = 237$) were considered passing while the group below 75% ($n = 173$) were failing. The Causal Dimension scale revised (CDS II) (McAuley et al., 1992) was used to determine the causal attributions students gave when prompted to react to a class test score. A Likert scale rating one to nine was used to determine the causal explanation for 12 items. In addition, students made an open-ended
statement to explain their performance on the test. A Pearson chi-square test demonstrated a statistically significant difference between the attribution statements made by the passing and failing students. When the open-ended statements were analyzed, 72.7% of students in the passing group referred to their effort and then ability. In the failing group, 59.1% of the students mentioned effort and ability in their statements; however, the second most referenced attribute were ability and task difficulty. This helps to demonstrate that task difficulty was determined by the student to be a major factor for their performance. The study also demonstrated that passing students had positive statistically significant differences between the attributions of failing students in locus of causality, stability and personal controllability. However, there were no statistical significant differences between the groups on the external controllability.

**SRL assessments.** In the past three decades, SRL instruments have evolved from retrospective or hypothetical contexts to capturing self-regulatory processes and motivational beliefs during learning. The first significant instrument was the Learning and Study Strategies Inventory (LASSI) that was an 80 question self-report inventory of students’ strategies for study practices (Weinstein, Schulte, & Palmer, 1987). The ten scales in the instrument assessed metacognition, motivation and behavioral definition of SRL. The response items ranged on a five-point scale from not at all typical for me to very much typical for me. The next instrument widely used was the Motivated Strategies for Learning Questionnaire (MSLQ) which had 81 questions corresponding to the three constructs of SRL (Pintrich, Smith, Garcia, & Mesachie, 1991, 1993). Students responded to the questionnaire using a seven-point rating scale from not at all true of me
to very true of me. The Self-Regulated Learning Interview Scale (SRLIS) provided a different perspective on instruments because it was comprised of six hypothetical problems (Zimmerman & Martinez-Pons, 1986, 1988). Each problem provided open-ended questions that are transcribed and coded using 14 self-regulatory categories that focus on the three constructs of SRL. Winne and Perry (2000) characterized these three early instruments as aptitude measures of self-regulation that predict future behavior.

In the 21st century, SRL has shifted to reporting students’ thoughts and learning processes while completing a task. For example, Azevedo, Guthrie, and Seibert (2004) created a think-aloud measure to assess SRL processes while students are in an online environment, such as hypermedia learning environment (HLE). Students report their thoughts and processes while completing a task and experts code the SRL processes into 35 categories that focus on five major areas: planning, monitoring, strategy use, task difficulty and motivation. Greene and Azevedo (2007) conducted research on 148 middle and high school students who scored a “low” mental model on the circulatory system pretest. The pre-and-post test consisted of writing down everything a student knew about the circulatory system. The pretest was 20 minutes; the students had 40 minutes to learn as much they could about the circulatory system using the hypermedia learning environment (HLE). Then, the students were given 20 minutes to complete the posttest. The researchers found six of the categories to be statistically significant indicators of students’ mental models. Four areas in the strategy use that were significant: coordinating informational sources, inferences, knowledge elaboration, and expectation of adequacy of information. The other area was monitoring, which included
the category of feelings of knowing as significant predictors of the students’ mental model. In task difficulty, the control of context category correlated negatively with the students’ mental models. More research is needed to understand hypermedia learning environments (HLE) and other technological systems.

**Microanalysis.** One of the emerging interests in the SRL literature is microanalytic methodology for assessing Zimmerman’s SRL model (2000). The microanalytic approach involves specific questions on self-regulatory processes and motivation beliefs before, during and after learning. They can either be open or closed ended questions and they are task specific and short to not interrupt the learning (Zimmerman, 2008). However, it is an event measure because it has a clear start and end, and it is embedded around a specific task. This fits well with Zimmerman’s social-cognitive perspective of SRL with the forethought, performance and self-reflection.

Cleary (2011) explains that there are five necessary components to SRL microanalysis. The first is individualized assessment because it is important that social interactions or biases do not interfere with the responses. The second component is assessing multiple self-regulation processes to see how they interact and impact each other. The third part is the content and structure of the questions. Microanalysis questions are created by using operational definitions of self-regulatory processes, and they are context specific. The fourth component is linking the learning event to a phase-specific regulatory process used before, during and after events. The fifth component is recording and scoring responses that can either be qualitative or quantitative in nature. The questions are usually asked directly and recorded verbatim or written on a piece of
paper. Since the questions are often single-item questionnaires, they have not been tested for reliability, but some multi-item self-efficacy scales have shown high alpha coefficients (.89 to .95).

Kitsantas and Zimmerman (2002) used a microanalytic approach on ten volleyball experts, non-experts and novices at a large southeastern university. All participants were women who were asked a series of questions before, during and after a practice experience as part of a structured interview. There were 12 self-regulatory measures combined to a single scale to predict women’s volleyball serving skill. The findings revealed that experts displayed higher levels of forethought, more self-regulatory processes during the performance phase and were more likely to self-reflect on their serving performance. The microanalysis measure provides for simultaneous recording of self-regulatory processes before, during, and after events which yields a more accurate and clearer account than earlier measures.

DiBenedetto and Zimmerman (2010) also used the microanalytic approach to study 51 high school juniors as they read, studied and were tested on a science passage on tornadoes. Students met individually with the researcher for at most 60 minutes where they read and studied a passage on tornadoes, were tested on the passage and asked questions throughout the protocol. The 11 microanalytic questions asked were from Zimmerman’s (2000) three-phase model and there were five microanalytic measures (self-efficacy, outcome expectancy, intrinsic values, goal setting and strategic planning) obtained in the Forethought phase (pre-reading). The performance phase was separated into three phases: one measure while reading (task strategies), two measures while
studying (task strategies and metacognitive monitoring) and one measure (metacognitive monitoring) upon completion of the test. The self-reflection consisted of four measures (self-evaluation, self-satisfaction, casual attribution and adaptive or defensive responses) as part of the posttest. The questions were online or asked during the task and students were separated based on achievement into high, average and low achieving students based on previous achievement scores and course levels. The results demonstrated that high achieving students exhibited more SRL subprocesses than those who were average or low achievers regardless of gender.

**Intervention studies using Zimmerman’s SRL model.** There have been SRL studies that have focused on one phase of the model or a specific SRL strategy (Stoeger & Ziegler, 2008; Zimmerman & Kitsantas, 2002), but few have examined students participating in the entire SRL cyclical model (Forethought, Performance, Self-Reflection and back to Forethought) in a general education classroom (Stoeger & Ziegler, 2008). Students who have been trained in self-regulation learning have shown high levels of motivation and achievement (Schunk, 1996; Wood, Bandura, & Bailey, 1990).

Zimmerman, Bonner, and Kovach (1996) created a four cyclical model of SRL for a classroom intervention. The four cycles are based on his SRL three phase model (Zimmerman, 2000). The first cycle is self-evaluation and monitoring. Since SRL is context specific, students may not use the same strategies for different tasks. Therefore, students need to first assess what is required to successfully complete the task and also monitor their knowledge and skills required for the task. Students usually judge their effectiveness from observations and previous experiences and outcomes. Therefore,
Students will be given time to think about what has helped them do well on projects and what has not helped them do well. What were their strengths when working on projects? What are areas for improvement? The next cycle relates to the forethought phase of the SRL model because it sets the stage for learning by having students create a goal and plan strategically. The third cycle is the performance phase where students implement their strategies and monitor their progress. Self-control processes play an important role in this process, focusing attention on the task and avoiding possible distractions. In the last phase (Self-Reflection), strategic outcome monitoring occurs. Students self-reflect by linking their learning outcome to the strategic processes they used in the performance phase. Students will either change, abandon, or keep their strategies depending on their reflection and outcome. This reflection will help with students’ ability to self-evaluate their work, set goals and use strategies.

Students will be able to experience the entire cyclical model at least once to learn, experience and apply the cyclical model before the intervention. In previous pilot studies conducted by the researcher, students reported completing the entire cyclical model was an important component for seventh graders to acquire the needed procedural and conditional knowledge to become self-regulated learners. Furthermore, Zimmerman et al. (1996) has four suggestions on how to design a unit to promote self-regulatory processes. First, students should be explicitly taught the SRL cyclical model and processes. Second, students need opportunities to practice SRL in learning settings. Next, SRL interventions should be mandatory or well structured. Last, students need to experience SRL to find value and utilize it in other learning settings. Paris and Paris
(2001) note that knowing how to use a strategy does not equate to students utilizing or finding value in it.

**SRL intervention research studies.** To the knowledge of the researcher, the following research studies are the only examples that have used all of Zimmerman’s SRL three phase cyclical model (Forethought, Performance and Self-Reflection). The only study that used Zimmerman’s SRL intervention (Zimmerman et al., 1996) was Stoeger and Ziegler (2008).

The Self-Regulated Empowerment Program (SREP) (Cleary & Zimmerman, 2004) was a training program based on a problem solving approach and Zimmerman’s SRL model (Bandura, 1997; Zimmerman, 2000). SREP was designed to encourage middle school students in their self-motivational beliefs, learning SRL processes and applying them in a middle school setting. A case study was conducted with Anna, a twelve year old Caucasian girl. According to tests, she had average intellectual potential, but failed tests in science and social studies. Furthermore, microanalytic tests demonstrated Anna had a negative motivation cycle with low self-efficacy, a lack of understanding of why she did poorly and a belief she could not improve. As a result, she was recommended for SREP. Anna was given eight 35 minute sessions of individualized training with a self-regulation coach (SRC). The main intervention used throughout the study was a self-regulation graph. After reviewing her baseline grades and recording the study strategies, the SRC and Anna set a moderately difficult performance goal. She was taught strategies and studied them before the test and wrote the study strategies she used on the graphing paper. After she received a test score, she graphed the score on the graph
and self-reflected by self-evaluating, making causal attributions and adaptive inferences. She completed this reflection process by being prompted by her SRC to compare her current and previous tests. The SRC helped her make a connection between the grades and strategies used to prepare for the test and emphasized improved test scores were a result of new study skills. She improved her science tests from failing before the intervention to 90%. The researchers stated that SREP would probably be enhanced by being used with another intervention or social program and that it cannot be applied to all students the same way. Anna increased her test scores by changing her cognitive and behavioral beliefs and actions, but also achieved the SREP goal of becoming a more independent learner.

In a more recent study using SREP (Cleary, Platten, & Nelson, 2008), seven urban high school students in the Midwestern region were placed into two groups (experimental and comparison). The students were selected using three criteria: ninth graders, having adequate learning skills and below average biology test scores. Five students were put into the experimental group, but three of them did not attend SREP regularly. The two other students in the control group received tutoring, but not the treatment. The students participated in tutoring sessions with a self-regulation coach (SRC) twice a week for approximately 11 weeks (23 sessions) for 50 minutes. The self-regulation coach (SRC) used a fixed method of teaching that included explicit training, modeling and guided practice. The modules were task analysis, goal setting, strategic planning, strategy training and self-reflection. A key strategy used was the Self-Regulation graph where students evaluated their effectiveness and made necessary
changes. After each test, students graphed their scores and wrote strategies that were used. The academic achievement measure used was the teacher created biology test scores, and students took the Self-Efficacy for Self-Regulated Learning scale, and Self-Efficacy for Outcomes and Task Interest Inventory (TII). The qualitative data consisted of the SRC taking notes on student behaviors and verbalizations as part of the microanalytic approach. Five Biology test scores served as a baseline test ($M = 70.6$) with the class average ($M = 77.6$). The intervention group increased ($M = 83.3$) compared to the average of the class ($M = 80.6$). The SREP group improved significantly on their test scores compared to the comparison group. Two students continued to fail the five tests except for one student who scored the class average on the last exam. Self-efficacy for self-regulated learning Reliability Change Index ($RCI$) = 2.26, $p < .05$ and self-efficacy for biology outcomes $RCI = 4.00$, $p < .01$ reported greater confidence at posttest compared to the pretest, but task interest did not change. It is important to note that the microanalytic approach was used on students’ self-judgments (attributes) and self-reactions (adaptive inferences) following biology tests. The responses were used by the SRC to guide and change the intervention to meet the needs of the participants. Both studies demonstrated how SREP improved academic achievement (e.g. test scores) and the more recent study demonstrated an increase in motivation, but with a very small number of participants.

In another study using Zimmerman’s model (2000), Schmitz and Wiese (2006) studied 40 civil engineers who participated with 21 of them answering questions in standard diaries as part of the experimental group. The five-week intervention was
designed to measure the daily learning and use of SRL processes by using diaries and time-series analyses (Zimmerman et al., 1996). Data were collected in two ways. A content pretest and posttest was given to both the control and experimental group. The second was a time-series analysis that corresponded with diaries to study the effect of each training component. The experimental and control groups were similar in their mean high school examination grades and participants reported little or no experience with self-regulation or study skills. The results indicated that the experimental group had higher improvement scores than the control group in effort, handling distractions and self-efficacy. Moreover, they also had higher decreases in attention deficits and procrastination. A linear trend analysis was used for the experimental group and found an improvement in percentage of the learned material, “understanding”, and satisfaction with the result, but study time did not change (Schmitz & Wiese, 2006).

In a more recent study, Stoeger and Ziegler (2008) examined fourth-graders’ use of time management on homework. Zimmerman’s SRL intervention (1996) was implemented in a quasi-experimental design (N = 219) to examine time management, self-reflection and self-efficacy. The intervention was found to be effective for the treatment group because analysis of variance (ANOVA) tests showed time management $F(1, 217) = 2.27, p < .05$, self-reflection $F(1, 217) = 6.70, p < .05$ and self-efficacy $F(1, 217) = 6.94, p < .05$ were all significant. Although self-regulation intervention techniques (goal setting, monitoring and self-reflective practices) are supported by empirical research (Locke & Latham, 2002; Schunk, 1996, 2001a; Zimmerman & Kitsantas, 1997), three of the four studies were completed with very small samples. Further research is
needed to extend the findings to provide a comprehensive self-regulation program for students to practice and use the cyclical model.

**Self-regulation and project-based learning.** Project-based learning requires high levels of knowledge, effort, and self-regulation (Blumenfeld et al., 1991). However, many teachers express the concern that their students are not independent learners. For example, Bill, an experienced teacher learning PBL in a case study, reflected on his experiences by stating, “I think many students have great difficulty assuming the responsibility for their own learning…for many students that aren’t used to that [responsibility], that might be very difficult for them to achieve” (Marx et al., 1994, p. 530). There are many reasons for this problem. One reason is that “few teachers effectively prepare students to learn on their own” (Zimmerman, 2002, p. 69).

Furthermore, many students believe that it is the role of the teacher to motivate them to learn and make learning interesting (Boekaerts & Niemivirta, 2000) instead of taking some personal responsibility. The next reason is that teachers often have students apply knowledge already taught during the unit, which does not necessitate the need for SRL skills (Boekaerts, 1996). The last reason is that self-regulation must be explicitly taught and students must experience it through practice to realize the value it can have for other learning opportunities (Zimmerman et al., 1996). There are many reasons why students are not being taught self-regulation.

Fortunately, it has been well established that self-regulation can be taught in a supportive and challenging environment (Boekaerts & Corno, 2005; Paris & Paris,
2001; Zimmerman, 2002) and improved through student effort (Zimmerman et al., 1996). Meyer, Turner, and Spencer (1997) conducted PBL case studies, concluding that more research is required to understand how learning processes can support student engagement and effort in challenging learning environments. One possible answer could be infusing self-regulation learning processes into a project-based learning unit, providing opportunities for students to manage their own learning in a challenging inquiry based learning environment.

To examine how self-regulatory learning processes can be infused in a project-based learning environment, the four major characteristics of project-based learning will be examined along with Zimmerman et al. (1996) SRL Classroom Intervention cyclical process.

**Project is the content.** Since self-regulation learning processes focus on procedural knowledge (e.g. learning the steps in the SRL cyclical model) and conditional knowledge (e.g. using the SRL procedure or strategy during a task), they can be infused into any curriculum or content (Zimmerman et al., 1996). PBL provides an opportunity for students to use the self-regulatory skills because the unit provides students many opportunities to create their product in contrast to closed questions (e.g. multiple choice questions) with right or wrong answers. In contrast, teacher-centered classrooms or classrooms that are comprised of students applying what the teacher has taught provide few opportunities to manage their own learning (Boekaerts, 1996).

**Driving question and constructive investigation.** These two PBL characteristics are combined because they relate similarly to how SRL can enhance
students’ answer to the driving question and their own constructive investigation. There are many ways to develop students to participate in a constructive investigation. For the purpose of this study, the five-phase Project-Based Inquiry Approach to Learning (Spires, Hervey, Morris, & Stelpflug, 2012) will be used as a vehicle to help frame the students’ investigation into the PBL unit. The five phases are: asking a compelling question or in this case exploring the driving question, gathering and analyzing information, creating and synthesizing information, evaluating and revising, and publishing, sharing and acting (presenting). This model parallels with the SRL intervention cycle (Zimmerman et al., 1996).

In the PBL inquiry approach, students must first ask a compelling question or explore ways to approach the driving question. This exploration often appears in a “need to know” list to help activate prior knowledge and elicit interest in exploring possible ways to approach the question or problem posed (Larmer & Mergendoller, 2010). In the SRL intervention cycle, the first step is to self-evaluate and monitor what knowledge and skills a student needs to investigate this question or problem further. Students usually judge their effectiveness from observations and previous experiences and outcomes. Students will record their notes including their “need to know” list in a designated area (e.g. journal). The next process in the SRL cyclical model relates to the forethought phase because it sets the stage for learning by creating a goal and planning it strategically. This SRL phase is still considered part of the first step in the inquiry approach because it relates to the planning stage.
The second step in the PBL inquiry approach is gathering and analyzing information directed toward answering the driving question or posed questions. This is when students explore their topic by researching on the internet, surveying and gathering information about their problem or testing their hypothesized questions. This is usually the stage where students and teachers begin to struggle. Therefore, the third process in the SRL intervention phase is very important because it is when students implement their strategies and monitor their progress. Self-control processes play an important role in this process by focusing attention on the task and avoiding possible distractions. Students can easily become distracted when surveying other students or searching for information on the internet or in books. Self-monitoring plays an important role in helping students’ keep track of their progress toward their goal.

The third step in the PBL inquiry approach is when students create and synthesize information. This step occurs after students have completed research and thought about other possible ways to create a project to answer the question. The third process in the SRL intervention phase is critical because it is when students implement their strategies and monitor their progress.

The fourth step in the PBL inquiry approach is when students evaluate and revise their work. The last SRL intervention cycle occurs because students self-reflect through strategic outcome monitoring. Students self-reflect by linking their learning outcome to the strategic processes they used in the performance phase. Students self-evaluate by using an external measure (e.g. rubric) and also receive feedback and suggestions from
peers or teachers. Students’ reflection helps them keep or revise their goals and strategies to finish the task.

The last step in the inquiry approach is to publish, share and act (present). Finishing the project can be quite different than presenting it to an audience. Depending on the project, this step could include the third or fourth SRL intervention cycle. Students may need to use different strategies for the presentation portion of the project or they may need to create an outline for their presentation. Or, students may self-reflect and review their project to ensure that they know their audience and can address any questions or justify their decisions. This reflection will increase students’ ability to self-evaluate their work, set goals and use strategies for their current project before their presentation.

**Student driven (choice).** PBL provides opportunities for self-directed actions, such as student choice and pursuing one’s interest. However, many students have difficulty managing these responsibilities. Research shows that students’ motivation and opportunities to demonstrate their own learning often decline from elementary school through the middle school years (Cleary & Zimmerman, 2004). To assist students in these self-directed PBL opportunities, self-regulatory processes, specifically goal setting, when taught and practiced, can be keys to promote persistence and increase self-efficacy. Moreover, Ryan and Deci (2002) noted that autonomy (choice in goals) is key to self-regulation. According to Latham and Budworth (2007), four student outcomes of setting goals are: choice, effort, persistence and cognitive strategies. These traits are also found in a project-based unit:
1. Choice – In a PBL, students will pursue different interests and ways to create projects related to the driving question and learning standards. Zimmerman (2008) connects choice to self-regulation by explaining that goals motivate choice and direct attention to the task. In ideal situations where challenging work matches student intense engagement, “flow” can occur. Csikszentmihalyi (1990) states that “flow” is a conscious state of being occurring when challenging environment match the skill set needed. Moreover, the role of immediate and purposeful feedback allows for a sense of control and self-directedness on the task.

2. Effort – PBL classrooms are student-centered, which puts the onus on students to create and finish their projects. Setting appropriately challenging goals can help students put more effort into the task especially if they self-monitor their progress (Zimmerman & Cleary, 2006).

3. Persistence – Similar to effort, students will need persistence because PBL classrooms foster challenging environments. By setting challenging goals, an individual is more likely to continue despite setbacks (Latham & Budworth, 2007).

4. Cognition – In a PBL environment, students may be working individually or collaboratively on a task that will help them answer the driving question. Setting goals can lead them to develop cognitive strategies to help them complete the tasks and promote processing information at deeper levels (Grolnick & Ryan, 1987).
To summarize, providing a student-centered project can be challenging for students, but a support structure such as infusing self-regulatory learning processes can help students persist further in the task (Ryan & Connell, 1989). To assist in understanding how SRL can be used in a PBL unit, a dissertation will be analyzed to review its design, findings and limitations to help build support for further research in this field.

**Gerlach (2008).** To the researcher’s knowledge, there has only been one study that examined self-regulation learning and project-based learning (Gerlach, 2008). Gerlach’s dissertation entitled, *Project-Based Learning as a Facilitator of Self-Regulation in A Middle School Curriculum* had 56 seventh grade American history students in a suburban public school in Pennsylvania as participants. The purpose of this study was to determine if project-based learning supports self-regulatory behavior in a middle school setting. The project focused on having students create a historical journal to answer the driving question, “How did the French and Indian War and the Revolutionary War affect individuals?” The qualitative data measured was a student weekly reflection form (SWRF) that was analyzed by using NUD*IST to measure self-monitoring and self-reflection. The other qualitative data was teacher-student interviews. The quantitative data was pretest and posttest measures of Bandura’s self-efficacy for self-regulation scale (2006) and Atman’s (1987) Goal Orientation Index (GOI).

The findings revealed that the GOI increased in the Reflecting and Planning Subscales at the .01 level of significance using a one-tailed t-test. Bandura’s Self-Efficacy scale showed no significant difference between the pretest and posttest. Gerlach noted some major limitations in her study including taking place in one school with two
classes (56 students). In addition, the researcher assumed the students’ self-reported responses on the Student Weekly Reflection Forms (SWRFs) were an accurate account of their work and the feedback they received from their peers. The last limitation was that the SWRF may not represent students’ complete documentation in project-based learning.

**Current study.** According to the project-based learning literature, a self-regulation learning intervention has not been researched to determine its impact on student achievement and motivation (Barron, 1998; Boaler, 1999; Cognitive and Technology Group at Vanderbilt, 1992; Gerlach, 2008; Marx, Blumenfeld, Krajcik, & Soloway, 1997; Penuel et al., 1999; Toolin, 2004). In addition, there is very limited research on using Zimmerman’s SRL model in a classroom intervention (Cleary, Platten, & Nelson, 2008; Cleary & Zimmerman, 2004; Schmitz & Wiese, 2006; Stoeger & Ziegler, 2008). The value this current dissertation study brings is that it uses Zimmerman and Moylan’s social-cognitive perspective of SRL model (2009) to determine whether differences exist between students who receive SRL instruction or not in a PBL setting. Moreover, to the researcher’s knowledge there is only one study examining how students self-regulate in PBL classroom. This extends Gerlach’s dissertation by providing student quotes of how they used self-regulation in a SRL infused PBL unit, providing insights into how students self-manage a complex project. Another aim is to understand how high and low achieving students self-regulate in a SRL infused PBL environment to determine if it supports and extends the current literature (Zimmerman & Kitsantas, 1999). Finally,
while much research supports the academic benefits of SRL, this study provides teachers a practical way to teach SRL and infuse it into a PBL unit.

**Research Questions**

The purpose of this quasi-experimental mixed methods study is to infuse self-regulatory learning processes into project-based learning to examine three questions:

**RQ 1.** Are there differences between the treatment and the comparison groups in students’ self-efficacy beliefs for self-regulated learning, self-efficacy for learning form (SELF), project artifact achievement and content knowledge?

**RQ 2a.** How do middle school students apply SR processes in a SRL infused PBL environment?

**RQ 2b.** How do high and low achieving students self-regulate in a SRL infused PBL environment?

It is hypothesized that the treatment group will outperform the comparison group in self-efficacy, project artifact achievement and content knowledge based on the existing literature on SRL instruction. Table 1 has a summary of how the research questions are supported by the literature review.
Table 1

**Literature Review Summary**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Literature review</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 1. Are there differences between the treatment and the comparison groups in</td>
<td>Schmitz and Wiese (2006)</td>
</tr>
<tr>
<td>learning form (SELF), project artifact achievement and content knowledge?</td>
<td>Zimmerman and Bandura (1994)</td>
</tr>
<tr>
<td></td>
<td>Zimmerman, Bandura, and Martinez-Pons (1992)</td>
</tr>
<tr>
<td>environment?</td>
<td>Stoeger and Ziegler (2008)</td>
</tr>
<tr>
<td></td>
<td>Zimmerman and Bandura (1994)</td>
</tr>
<tr>
<td></td>
<td>Zimmerman et al. (1992)</td>
</tr>
<tr>
<td>PBL environment?</td>
<td>Cleary (2011)</td>
</tr>
<tr>
<td></td>
<td>Kitsantas and Zimmerman (2002)</td>
</tr>
</tbody>
</table>

It is also hypothesized that students will exhibit numerous SRL strategies in a PBL environment and that high achieving students will demonstrate more SRL strategies compared to other low achieving students (DiBenedetto & Zimmerman, 2010; Zimmerman & Kitsantas, 1999).
CHAPTER THREE

This chapter provides the research methodology including the research design, description of the participants and setting, the measures, data collection and data analysis procedures.

Research Design

A mixed method quasi-experimental design was used because the quantitative data helped determine if there were differences in students’ self-efficacy beliefs, content knowledge and project artifact achievement. The qualitative data helped to understand how the treatment group used SR processes in a PBL environment. Lastly, a microanalytic approach study of four participants in the treatment group assisted in understanding how high and low achieving students self-regulate in a SRL infused PBL environment.

The study was a quasi-experimental design because the classes were intact at the beginning of the school year and three pretest and posttest designs were included in the study along with project artifacts that comprised the Business unit (Creswell, 2008). The treatment group also received a four-week intervention prior to the Business unit and a SRL infused intervention took place during the Business unit by completing project artifact reflections and progress feedback forms. The teacher taught five Civics classes during the school year and four of them were selected to participate in the study. The one
class excluded had a different student composition than the other classes with primarily advanced level learners. The comparison and treatment groups had class every other day for 90 minutes.

**Participants and Setting**

Fifty-two 7th grade Civics & Economics students participated in the study from four intact Civics & Economics classes. Two of the classes (one treatment and one comparison) included special education students with approximately 33 – 45% of the class receiving services. The special education students were excluded because it was not the focus of this research study. The study was conducted at a middle school (grades five to seven) that had 500 students in the suburbs of a large city in the mid-Atlantic region. Table 2 shows the demographics for both the comparison and treatment groups.

### Table 2

**Demographics of Participants**

<table>
<thead>
<tr>
<th></th>
<th>Treatment (n=24)</th>
<th>Comparison (n=28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>13.1</td>
<td>13.3</td>
</tr>
<tr>
<td>Male</td>
<td>10/42</td>
<td>15/54</td>
</tr>
<tr>
<td>Female</td>
<td>14/58</td>
<td>13/46</td>
</tr>
<tr>
<td>Asian</td>
<td>4/17</td>
<td>2/7</td>
</tr>
<tr>
<td>Caucasian</td>
<td>17/71</td>
<td>24/85</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1/4</td>
<td>1/4</td>
</tr>
<tr>
<td>More than 2</td>
<td>2/8</td>
<td>1/4</td>
</tr>
<tr>
<td>ethnic groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civics GPA</td>
<td>3.57</td>
<td>3.63</td>
</tr>
</tbody>
</table>
According to the school district’s website, approximately 12% of students were Hispanic and 8% were Asian Americans, 4% African American, 67% Caucasian and 9% were considered more than two ethnic groups. The free and reduced lunch rate was 8.4% with all students in the school living in the surrounding neighborhood. The research sample was less ethnically diverse than the school district’s demographics. The treatment group in the study had no African American students, four Asian students (17%), 17 Caucasian students (71%), one Hispanic student (4%) and two students that had more than two ethnic groups (8%). The comparison group also had no African American or Hispanic students, two Asian students (8%) and 25 Caucasian students (89%). In addition, four students from the treatment group were selected to participate in the microanalytic approach after the school year was completed based on their seventh grade Reading and Social Studies SOL scores and Civics grade point average (GPA).

**Microanalytic approach participants.** The assent and consent forms given for the study indicated that the researcher would not know which students participated in the study until after the school year ended. Therefore, the researcher selected the microanalytic participants after the school year. The first step in choosing microanalytic approach participants was that they had to be from the treatment group, and they met the criteria for project artifact grades and SOL scores. All the names are pseudonyms.

After analyzing all the students in the treatment group, Neil and Jessica were selected because they were two of eight students who met the higher achieving criteria (higher than a 500 SOL in both 7th grade tests and 90 or higher on the project artifact tests). Neil and Jessica were primarily selected because they completed their reflections
thoroughly and provided insights into how they utilized the SRL strategies in the PBL environment. Andre and Carey were two of five students who met the lower achieving criteria (lower than 500 on both SOLs in 7th grade and 80 or less on average of the project artifact tests). Andre was selected because he demonstrated the most growth in regards to his self-efficacy scores and overall project artifact achievement except Artifact D. There were only two girls who met the low achieving criteria and both had missing data points with similar problems of absences and missing work. Another reason Carey was selected was because there was a desire to have a balance of two girls in the case study and two boys. Although she was missing data on her progress feedback form, her artifact reflections helped to understand how she self-regulated in a PBL environment.

**Neil.** He was a 12 year old Caucasian male who excelled in school, especially math and science. He was a very conscientious student who consistently earned A’s in all his classes. He earned 553 on his Civics SOL and 534 on his 7th grade Reading SOL, which are both considered pass advanced. He was selected as a microanalytic approach participant because earned 90 or above on all his project artifacts and 500 or above on his SOLs. Neil excelled on this project in part because he is highly motivated, self directed and participates in many challenging extracurricular inquiry-based activities. He was in all the advanced courses offered in Math, Foreign Language and Language Arts.

**Jessica.** She was a 13 year old female of two or more races who excelled in school. This was the first year she attended the school and earned primarily A’s in all her classes with an occasional B in an advanced class. She was selected as a microanalytic approach participant because she earned 90 or above on all her project artifacts and 500
or above on her 7th grade SOLs. Jessica was a quiet student who always went above and beyond the required assignment in projects and classwork. She was in all the advanced courses offered in Math, Foreign Language and Language Arts.

Andre. He was a 13 year old male of two or more races who was very quiet and before the intervention needed frequent check-ins to help him stay on-task. He wanted to do well, but school was difficult for Andre. He lacked organization skills and needed help with written expression and study habits. He passed all his state tests and demonstrated B or C grade work in class. His quiz and test scores in Civics were frequently ranging between B - D.

Carey. She was a 13 year old Caucasian female. She was very focused on her social life and school work came secondary. She missed class on multiple days during the study and had difficulty making up her work. She received remedial support in reading, which means her reading level was below grade level and she consistently needed prompting to complete her work in and outside of class. She was consistently a C student in class and had a few B’s in other classes. Her quiz and test scores in Civics were frequently either C’s or D’s.

Study Variables

Student secondary data. There were two standardized tests that were used as data points in the study. The seventh grade Reading SOL and the Civics & Economics tests were administered in May 2013.

Civics & economics SOL. In Virginia, all Civics & Economics students take a 40 multiple-choice test in May or June based on the Civics & Economics curriculum
framework (2008) that was created by the Virginia Department of Education. The four major categories determined by the state are Structure of American Government, Political and Governmental Processes, Economic Principles and Decisions and United States Economy.

7th grade reading SOL. In Virginia, all seventh grade students take a 45 multiple-choice or technology-enhanced item types (drag & drop questions on the computer) test in May or June based on the Reading curriculum framework (2010) that was created by the Virginia Department of Education. The Reading curriculum was broken into four major components: Communication: Speaking, Listening and Media Literacy, Reading, Writing and Research.

Dependent variables. The dependent variables were Children’s Self-efficacy for Self-regulated Learning, the Self-Efficacy for Learning Form (SELF), project artifacts, content knowledge, progress feedback forms and project artifact reflections. The measures were researched to ensure that they met the research goals and were reliable and valid.

Independent variable. The independent variable had two levels: the treatment and the comparison groups. The treatment group received a four week intervention study of SRL processes prior to the Business project and received a SRL infused intervention during the Business project by completing progress feedback forms and project artifact reflections.

SRL intervention. During the four week intervention for the treatment group, both groups were completing units on the Judicial and Executive Branches. Both groups
received the same instruction for both units, but the treatment group had less class time to complete certain activities because they were receiving the intervention. The SRL intervention was created by studying previous Zimmerman SRL classroom intervention studies (Cleary, Platten, & Nelson, 2008; Cleary & Zimmerman, 2004; Schmitz & Wiese, 2006; Stoeger & Ziegler, 2008). In addition, Paris and Winograd (1999) characteristics of successful intervention for strategy instruction and Zimmerman et al. (1996) four suggestions’ to designing a unit to promote self-regulatory processes were also used.

During the SRL intervention training, students were taught each phase of Zimmerman and Moylan’s social-cognitive perspective of SRL cyclical model (2009) and the major processes (e.g. goal setting, monitoring and self-evaluation). The intervention was ten classes, and the first three classes consisted of helping to share specific strategy instruction with students – the when, how and why to apply strategies which is essential for SRL (Paris & Winograd, 1999). The fourth and fifth classes consisted of applying the strategies to a classroom task. The last five classes in the intervention focused on having students apply new strategies into their project work. In addition, they completed reflections on how their new knowledge could be transferred and used in future academic situations. Research supports that explicitly taught SRL cyclical model and processes with opportunities to practice SRL in learning settings is an effective approach to teaching SRL (Zimmerman et al., 1996).

**Data Collection Instruments**

There were four quantitative instruments, one qualitative instrument and two microanalytic instruments used as data collection in the study.
**Quantitative instruments.** The four quantitative instruments used in research question one were Children’s Self-efficacy for SRL, Self-Efficacy for Learning Form, project artifacts and content knowledge. Two self-efficacy instruments were selected because they had different focuses. The SELF measure provides a more general examination of motivational and cognitive academic learning questions whereas Bandura’s Children’s scale provides a more specific self-regulated learning questions.

**Children’s self-efficacy for self regulated learning (Bandura, 2006b).** The Children’s Self-efficacy SRL scale (Appendix A) was created by Albert Bandura to assess the capability children felt to complete certain tasks. In other words, the scale assesses the degree to which students think they can and cannot complete specific tasks. The statements on the scale represent three self-efficacy aspects: Self-Efficacy in Enlisting Social Resources, Self-Efficacy for Academic Achievement, and Self-Efficacy for Self-Regulated Learning, but only Self-Efficacy for Self-Regulated Learning was used in the study during the pre-and-posttest. The reason for this is the other two scales did not represent what was taught during the study. The students rated their degree of confidence from a 0 (cannot do it at all) to 100 (highly certain can do) scale. (Sample item for Self-Efficacy for Self-Regulated Learning: “Get myself to study when there are other interesting things to do”.) For this study, the scores of each of the ten items were combined to create one composite score for each student.

Pajares, Johnson, and Usher (2007) conducted a validity study using the instrument with 3,760 students in grades four to eleventh grade. The study examined five separate measurement models, validating all of them using compare fit index (CFI),
which assesses a model fit compared to a baseline model. Values near 1.0 indicate it is an optimal instrument. The Root Mean Square Error Approximation (RMSEA) was also used with a 0.0 indicating the best fit between the population covariance matrix implied and the estimated sample data with a score of less than .08 as reasonable. The results were the following: boys CFI = .97, RMSEA = .06; girls CFI = .98, RMSEA = .05; elementary students (4th – 5th grades) CFI = .99, RMSEA = .99; middle school students (6th – 8th grades) CFI = .97, RMSEA = .06 and high school (9 – 12th grades) CFI = .96, RMSEA = .07. For this current study, a factor analysis (using SPSS v21) was utilized to construct validity. In a test of inter-item reliability from this current study, a Cronbach’s alpha of .62 resulted, which is considered a questionable internal consistency of the scales (George & Mallery, 2013).

**Self-efficacy for learning form (SELF) (Zimmerman, Kitsantas, & Campillo, 2005).** The SELF scale originally had 57 items, but for this study the abridged form with 12 items was used called SELF-A (Appendix B). The purpose of the SELF instrument was to understand students’ self-efficacy beliefs in relation to their use of specific self-regulatory processes in different kinds of academic environments. Students rated their response on a scale from 0% (Definitely cannot do) to 100% (Definitely can do). A sample question was “When you think you did poorly on a test you just finished, can you go back to your notes and locate all the information you had forgotten?” For this study, the scores of each item were combined to create one composite score for each student.

To ensure validity and reliability, Zimmerman and Kitsantas (2009) conducted a study using 223 college students. The reliability coefficient for students’ scores was .97
and the fit of a single factor structure model was CFI = 1.00 and gender differences were found to be not statistically significant. For this current study, seven of the nineteen questions were taken out (see Appendix B-1) to shorten it for the students taking it. With the exclusion of these seven questions, a test of inter-item reliability was conducted with a result of Cronbach’s alpha of .79, which is considered between acceptable and good internal consistency of the scales (George & Mallery, 2013).

*Project artifacts (Dippold, 2012).* There were four project artifacts (Appendix C) that students completed during the business unit. The business unit was created by the researcher and it was based on the Virginia Department of Education (VDOE) Civics & Economics Curriculum Framework (2008). The scores of reviewer one and two were combined into one composite score for each student on each artifact. The two reviewers were educators who were trained by the researcher to grade each project artifact by using the rubrics (Appendix C). The project included the four major criteria that the Buck Institute for Education (BIE) stated are needed for a project-based unit (Thomas, 2000):

1. The projects must be based on the curriculum and not an extension or enrichment activity. The business project was the seven week economic unit that met the Virginia SOLs about businesses, the role of the U.S. government in the economy, and basic economic concepts.

2. The project must be realistic, usually with a focused question or problem that students work to answer. The driving question that the students explored throughout the project was “What is necessary to run a successful business?”
3. The project must involve constructive investigation. Throughout the unit, students constantly referred back to the driving question to construct their own understanding of what a successful business is by examining real-world examples and gathering ideas during the class lessons. In addition, students were encouraged to be innovative in their design, project artifacts, and presentations by constructing something new, for example, a new way of displaying what they have learned (website, pamphlet or video).

4. The project must be student-driven to a significant degree with the teacher helping to facilitate and guide students who may have veered from the original goals of the unit. They represented their understanding of the artifact in any format, but had to refer to the appropriate rubric to ensure it fulfilled the expectations.

Students completed four project artifacts during the unit focused around the driving question, VA state standards, Secretary’s Commission on Necessary Skills and the Virginia Workplace Readiness Skills. Students worked individually on creating, marketing and budgeting for a business product. On Business Day, two students could merge their business products into one business and present it to fifth graders, administration, and other teachers who served as customers for 25 – 35 minutes. In addition, at least two community members from the business community or school board provided feedback on each presentation regarding their product, marketing, and design. There were approximately 24 fifth graders who were each given 10 $1.00 bills for each Civics class.
For this business unit, the following Civics & Economics (SOL) standards were taught by having students relate their understanding of the how to run a successful business to the standards (Appendix I). The publication, *What Work Requires of Schools*, the Secretary’s Commission on Achieving Necessary Skills (SCANS) 2000 (Appendix J) was created by the United States Department of Labor and Education (U.S. Department of Labor, 1991) to help educators prepare students for workplace skills. In the report, five skills that effective workers will be able to use are identified:

- **Resources** (Know how to effectively use time, money, materials, space and staff)
- **Interpersonal Skills** (Work well on teams, serve customers and negotiate)
- **Information** (Acquire and evaluate data, interpret and communicate and use computers to process information)
- **Systems** (Design, monitor, and correct performance of social, organizational and technological systems)
- **Technology** (Select equipment and tools and apply technology to specific tasks)

The document, *Workplace Readiness Skills for the Commonwealth: Needs Identified by Virginia Employers*, (Appendix K) was categorized into three main areas: Personal Qualities and People Skills, Professional Knowledge and Skills and Technology Knowledge and Skills (Virginia Department of Education, 2010). Within the three major areas, 21 skills have been identified that employees need to obtain.
**Content knowledge.** Content knowledge (Appendix D) was defined as the material students were expected to learn from a specific unit, in this case, business concepts related to economics. The questions were created by the teacher and curriculum administrators, but based on the Virginia Department of Education (VDOE) Civics & Economics Curriculum Framework (2008). The same 20 question multiple-choice test was administered before and immediately after the unit. Students had one to two questions on each standard that the student was required to know according to the SOLs created by the Virginia Department of Education.

**Qualitative instrument.** There was one qualitative instrument used in research question 2a.

**Project artifact reflections (Dippold, 2012).** There were project artifact reflections (Appendix E) administered after each artifact was turned-in to the teacher except for Artifact D. Since Artifact D was answering the driving question, students completed the reflection assignment in one class and that is why they did not complete an artifact reflection. The project artifact reflections helped to explain how students infused SRL in a PBL environment, and they were created based on Zimmerman and Moylan’s (2009) social-cognitive perspective of SRL. In addition, it helped students reflect personally on their own work and either change or continue to use the same strategies to complete their work. To scaffold the reflection process, students were given prompts, such as “How well did I…”

* set short and long term and realistic goal(s) (example: S-M-A-R-T goal)
* use a strategic planner or method to plan ahead “How well did I…follow guidelines”.

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The reflection question prompts were from the SRL processes that were learned during the SRL intervention and found on the SRL Resource Page (Appendix H). The forethought question was “Before the actual performance or task, what strategies worked well for you to prepare to meet your goals or tasks?” The performance question was “While working on the task, what strategies did you use to monitor and focus on completing the task?” The self-reflection question was “When reviewing my current work or task, did I achieve my goal? Why or why not? What action will I take to make continuous improvement?”

**Microanalytic processes measure of self-regulated learning.** To understand how two high and low achieving students from the treatment group self-regulated in an infused PBL environment, microanalytic processes measures of self-regulated learning were used. Furthermore, the microanalytic process was used to understand how students think, behave, and feel in a SRL infused PBL environment during each of Zimmerman and Moylan’s SRL three phase model (2009). This approach was adapted from DiBenedetto and Zimmerman’s works (2010) and Kitsantas and Zimmerman’s (2002) study. Unlike the previously mentioned studies, this microanalytic approach occurred without a formalized script and it demonstrated a way that classroom teachers and future researchers could implement the microanalytic approach.

**Phase one: Forethought phase measure.** When Project Artifact A, B and C were passed out, students completed a forethought question on a third page of the project artifact description sheet to see how capable they felt to achieve their desired goal. They
did not write their name on the sheet, but had an identification number. The self-efficacy question was the following:

“On a scale from 0 – 100, how sure are you that you can achieve your desired goal on this project artifact?”

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0  10  20  30  40  50  60  70  80  90  100

Cannot do at all  Moderately can do  Highly certain can do

**Phase three: Self-reflection phase measure.** When students completed the artifact reflections, students completed a self-satisfaction question at the end of the reflection. The question asked was, “The degree to which I value the task(s) I worked on is ____ out of 100. Explain how much you value the task(s) you worked on. Why?”

**Phases one to three: Progress feedback form (Dippold, 2012).** Students in the treatment group were given a progress feedback form (Appendix L) that was created by the researcher based on Zimmerman’s three phase cyclical model of self-regulation (2000). The following questions were used:

**Phase one: Forethought phase measure**

SMART goal: Students wrote their SMART goal in the space provided.

**Phase two: Performance phase measure**

Self-monitoring: How do I know if I am making progress toward my goal?
Phase three: Self-reflection phase measure

Self-evaluation: Did I accomplish my SMART goal? Why or why not? Explain.

Casual attribution: Why did you give yourself that grade?

Self-satisfaction: “The degree to which I value the task(s) I worked on this week ___ out of 100. Explain how much you value the project artifact you worked on this week. Why?

Students used it at least once during each of the first three project artifacts. This step was essential for students learning the SRL cycle because Schunk and Ertmer (2000) found “…providing students with a learning goal and progress feedback led to the highest self-efficacy, motivated strategy use, and achievement” (p. 641). Students were given a grade and the teacher also gave a grade based on how well they used their time and self-reflected on their work. Students then were instructed to review their work from the previous class and to adjust their goal or specific tasks for the period. When students completed the progress feedback form, they experienced the entire SRL cycle.

Project Based Learning (PBL) Unit

The project based learning unit was a seven week unit and had students learn about running a business by teaching them economic concepts through various project artifacts (Appendix C).

Business design (project artifact a). The first project artifact in the business unit was to answer the essential question, “How do you create a business product that people
want to buy?” Students brainstormed how to answer the question as a class and then created specific questions they wanted to explore to help them answer the essential question. In all classes, the students discussed the importance of knowing what the “customer” wants and gathering research in different ways. Most students created a Google Form or Survey Monkey, but some students conducted interviews, short questionnaires, or just examined businesses online to replicate and study. The SCANS skills used were in understanding how systems work, more specifically, how to design a business in Table 3.
<table>
<thead>
<tr>
<th>Characteristics of PBL (Thomas, 2000)</th>
<th>Business Project (Dippold, 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project is the Content</td>
<td>The Business project is constructed by having students complete four project artifacts that comprised the PBL unit. The project artifacts helped students acquire knowledge about economics and skills to apply to their business.</td>
</tr>
<tr>
<td>2. Driving Question or Problem</td>
<td>The Business project consists of a driving question, “What is necessary to run a successful business?”</td>
</tr>
<tr>
<td>Requirements:</td>
<td>It also consists of three essential questions for Project Artifacts A – C that help answer the driving question in Project Artifact D.</td>
</tr>
<tr>
<td>*Focus on district and state standards</td>
<td>Project Artifact A: How do you create a business product that people want to buy?</td>
</tr>
<tr>
<td>*Reasonable to answer and possible ways to answer it</td>
<td>Project Artifact B: How do you create a budget to run a successful business?</td>
</tr>
<tr>
<td>*Real-world problem – meaningful to explore in-depth</td>
<td>Project Artifact C: How does a successful business market their products and standout to customers?</td>
</tr>
<tr>
<td>3. Constructive investigation</td>
<td>Students conduct research and create a business plan and budget to prepare for Business Day</td>
</tr>
<tr>
<td>4. Student Driven – student choice and interest</td>
<td>Students selected their own business and decided how they want to run it (what to sell, how to sell it, research, budget and advertise)</td>
</tr>
</tbody>
</table>
By examining the results of their market research, students learned the importance of monitoring and correcting the performance of their organization (business) system in order to make a profit. Students made decisions as to whether they should make this product, make changes, or start a new product. During the project artifact, the students were taught a lesson on the different types of businesses and could apply the concepts of supply & demand, incentives and price and consumer sovereignty from a previous unit.

The project rubric included zero to five point scale that included three categories: justification business product(s), research (evidence provided) and products for a total of 15 points and then multiplied by two to have 30 points (Appendix C).

**Budget (project artifact b).** The second project artifact was to create a budget. The essential question that students answered was “How do you create a budget to run a successful business?” Students brainstormed how to answer the question as a class and then created specific questions they wanted to explore that would help them answer the essential question. During the creation of this project artifact, students learned about the role of banks, the Federal Reserve, how individuals, businesses and government were involved in the transfer of goods and services (economic circular flow chart) and how taxes are used to provide public goods and services. The SCANS skill used during this task was utilizing resources. Students need to know how to effectively use time, money, materials, space and staff because they have a limited amount of money in their budget (at most $20.00). The VA Readiness Skills used are time, task and resource management because they have to organize and implement a productive plan (e.g. budget).
For the project, it was assumed that each business started with $10.00, and they could either borrow an additional $10.00 or save any part of the initial $10.00. The project rubric included zero to five-point scale that included two categories: budget and accuracy (on calculations) for a total of 10 points and then multiplied by two to have 20 points (Appendix C).

**Advertisement (project artifact c).** The students created an advertisement to market their business and products. They selected the format of their advertisement: video, poster, pamphlet, website and others approved by the teacher. The students answered the essential question, “How does a successful business market their products and stand-out to customers?” Students brainstormed how to answer the question as a class and then created specific questions they wanted to explore that would help them answer the essential question. The students examined how businesses marketed their products to certain audiences and how they could market their products to the 5th grade customers. The SCANS and Virginia Readiness skills used are technology to enhance the professionalism of their business (e.g. computer generated poster or pamphlet) and communicate their ideas (e.g. website). The project rubric included zero to ten-point scales that included three categories: authentic & professional, presentation & design, and persuasiveness for a total of 30 points and then multiplied by two to have 60 points (Appendix C).

**Reflection (project artifact d).** On Business Day, each Civics & Economics class sold their products to one 5th grade class for 25 minutes. Each fifth grader had $10.00, and they could only spend the money that they had been given. After the
business simulation, the seventh graders counted all the money that they earned and referred back to their budget sheet to determine if they made a profit. To complete the reflection assignment, students answered the driving question for the unit, “What is necessary to run a successful business?” The students were evaluated on answering the driving question, “The student provides a clear and convincing answer to the driving question.” They were also evaluated on whether “The student provides specific examples and details from the project and personal experiences to explain their answers.” The project rubric included zero to ten point scales that included two categories: answers the driving question and specific examples and details for a total of 20 points and then multiplied by two to have 40 points (Appendix C). Table 4 has a summary of the skills and content that were taught during the Business unit.
Table 4

Skills and Content Taught During the Business Unit

<table>
<thead>
<tr>
<th>Project artifacts</th>
<th>SOLs</th>
<th>SCANs</th>
<th>VA WRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11A, 11C, 12A</td>
<td>Systems</td>
<td>9. Reading and Writing</td>
</tr>
<tr>
<td>D</td>
<td>---</td>
<td>Information</td>
<td>13. Lifelong Learning</td>
</tr>
</tbody>
</table>

Data Collection Procedures

**Before the intervention.** In both the comparison and the treatment conditions, the SELF scale (Zimmerman, Kitsantas, & Campillo, 2005), Children’s Self-efficacy for Self-Regulated Learning scale (Bandura, 2006b) and the content test were administered by paper and pencil before the SRL training began for the treatment group (March). The content test was administered immediately before beginning the Business unit (April) and two classes after the Business project presentations (June).

**During the intervention.** Both groups learned the same curriculum as required by the Virginia Department of Education and took the Civics & Economics Standards of
Learning (SOL) end-of-the-year test. Students received instruction based on the instructional planning unit from the Buck Institute in Education (BIE) *Project-based Learning Handbook* (2nd ed). The driving question for the unit study was “What is necessary to run a successful business?” The materials for the assignment were created by the researcher. Each of the four project artifacts had an essential question that directly related to the driving question except Artifact D that had students answer the driving question. The real-world connection was that students were creating a business to sell to fifth graders on Business Day. To prepare them, four project artifacts were focused on a business design, budget sheet, advertisement and reflection. During class, students in the treatment group completed a Progress Feedback Form at least once during Project Artifacts A – C. In addition, at the beginning of each project artifact, they completed a question on self-efficacy and they completed a project artifact reflection except for Project Artifact D immediately after turning in Project Artifacts A – C.

**After the study.** After the project was completed, students in both the comparison and the treatment conditions were administered the SELF scale (Zimmerman, Kitsantas, & Campillo, 2005), Children’s Self-efficacy for Self-Regulated scale (Bandura, 2006b) and the content test by paper and pencil. The content test was identical to the pretest, but this time it was counted as a grade. Table 5 shows the instruments that were administered during the study.
### Table 5

**Instruments Administered**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Instrument</th>
<th>Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Children’s Self-efficacy for Self-regulated learning (Bandura, 2006b)</td>
<td>First day of study before treatment class was taught the four week SRL intervention. It was given the day after the classes presented at Business Day.</td>
</tr>
<tr>
<td></td>
<td>(Appendix A)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Self-Efficacy for Learning Form (Zimmerman, Kitsantas, &amp; Campillo, 2005)</td>
<td>First day of study before treatment class was taught the four week SRL intervention. It was given the day after the classes presented at Business Day.</td>
</tr>
<tr>
<td></td>
<td>(Appendix B)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Project Artifacts (Dippold, 2013)</td>
<td>Every three to five classes, project artifacts were completed except Artifact D was completed in one class.</td>
</tr>
<tr>
<td></td>
<td>(Appendix C)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Content Knowledge test (Appendix D)</td>
<td>The first day of the business unit (pretest) and the second class after Business Day (posttest).</td>
</tr>
<tr>
<td>2a</td>
<td>Project Reflections (Dippold, 2012)</td>
<td>The day the project artifact was turned in students in the treatment group completed the reflection.</td>
</tr>
<tr>
<td></td>
<td>(Appendix E)</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Progress Feedback Form (Appendix L)</td>
<td>At least once for Project Artifacts A-C, students in the treatment group used the form during class to work on their project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SRL intervention overview.** The four weeks of training prior to the Business unit were designed from empirically supported instructional practices and previous SRL interventions (Appendix F). This section will discuss the research and structure of the intervention.

**Research.** The characteristics of successful intervention for strategy instruction (Paris & Winograd, 1999) and four suggestions to designing a unit to promote self-regulatory processes (Zimmerman et al., 1996) were used in the creation of the intervention. In addition, the previous Zimmerman SRL classroom intervention studies provided additional support.

The first strategy instruction was modeling, which is when an expert shows students the different thought processes and steps involved in completing the task. To model SRL processes, direct instruction, which has been shown to be the most successful in supporting students to be self-regulated (Levy, 1996), was utilized during the first three classes. The first three classes consisted of helping to share specific strategy instruction with students – the when, how and why to apply strategies which is essential for SRL (Paris & Winograd, 1999).

The fourth and fifth classes consisted of applying the strategies to a classroom task. For example, students practiced writing SMART goals, and completing a progress feedback form and they received the SRL Resource Page. This was an important component to the intervention because research states there are three ways for students to learn about SRL: Indirect experiences, explicit instruction and guided practice (Paris & Paris, 2001). This SRL intervention achieved two of the three ways by providing explicit
instruction in Zimmerman’s SRL cyclical model and multiple opportunities for guided practice using the cyclical process. Zimmerman’s cyclical model (2000) was the focus for previous interventions (Cleary, Platten, & Nelson, 2008; Cleary & Zimmerman, 2004; Stoeger & Ziegler, 2008), but for this study Zimmerman and Moylan’s social-cognitive perspective of SRL (2009) was used. Table 6 explains the primary studies used in the SRL intervention. For example, Zimmerman et al. (1996) four suggestions’ to design a unit to promote self-regulatory processes and five characteristics of successful interventions for strategy instruction (Paris & Winograd, 1999) were incorporated into the intervention taught to the treatment group (Table 6).

Table 6

*Primary Studies used in the SRL Intervention*

<table>
<thead>
<tr>
<th>Characteristics of successful interventions for strategy instruction (Paris &amp; Winograd, 1999)</th>
<th>Four suggestions to design a unit to promote self-regulatory processes (Zimmerman et al., 1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Variety of strategies children can employ on academic tasks</td>
<td>• Explicitly taught SRL cyclical model and processes</td>
</tr>
<tr>
<td>• Teach and share specific strategy instruction – when, how and why to apply strategies</td>
<td>• Opportunities to practice SRL in learning settings</td>
</tr>
<tr>
<td>• Casual attribution for improved performance – strategy use is the reason for success not stable factors</td>
<td>• SRL intervention should be well structured</td>
</tr>
<tr>
<td>• Make strategy use observable – discussion and tutoring</td>
<td>• Students need to experience SRL to find value and use it in other settings</td>
</tr>
</tbody>
</table>
| • Students have opportunities to practice strategies in authentic settings | }
During the training, students were taught each phase of Zimmerman and Moylan’s SRL cyclical model (2009) and the major processes (e.g. goal setting, monitoring and self-evaluation). Research supports that explicitly teaching the SRL cyclical model and processes with opportunities to practice in learning settings is an effective approach to teaching SRL (Zimmerman et al., 1996). For example, students were explicitly taught how to create and use the goal setting strategy of S-M-A-R-T (specific-measurable-attainable-realistic-timely) goals during a PowerPoint presentation. To scaffold learning and applying the SMART goal process, students observed the teacher modeling how to create a SMART goal in their personal lives (e.g. training to run an eight minute mile).

The next few classes in the intervention went from applying new strategies to reflecting on how they can be transferred and used in future academic situations. During the sixth – seventh days of the intervention, students were given more practice in applying SRL strategies to their work. For example, students analyzed a Calvin and Hobbes cartoon. In the cartoon, Calvin demonstrated poor self-regulatory processes (e.g. no focus or goals, a lack of self-control and poor time management) and the students served as the “expert” and explained what Calvin should have done. In addition, students completed a project artifact reflection explaining the SRL processes they used during their Executive Branch project. With the practice and feedback through class discussion of the cartoon and written feedback on the project artifact reflection, students were able to apply the SRL strategies to classwork assignments. Please refer to Appendix F, to see the ten class periods of instruction and the research supporting it.
Structure. The classes met every other day for 90 minute block period where students received approximately 20 - 35 minutes of SRL instruction or guided practice during the first five classes. In the 6 – 10 classes, the SRL practice was embedded into the curriculum for students to practice. During the four week intervention, both the treatment and comparison received the same content (Judicial and Executive Branch) activities and assignments. The major differences were that the comparison group had more time to work on the assignments in class.

SRL intervention procedures. After the Children’s Self-efficacy for Self-Regulated learning (Bandura, 2006b) and SELF scale (Zimmerman, Kitsantas, & Campillo, 2005))were administered, the SRL intervention unit was started. Next, the teacher modeled, discussed and had students answer questions on the Introduction to Self-Regulation Learning (SRL) PowerPoint slides one to ten (Appendix G). These slides focused on an explanation of SRL, what SRL is and is not, why SRL is valuable and examples of how SRL can be used in daily life. On the second day, the teacher modeled, discussed and had students answer questions on the Introduction to Self-Regulation Learning (SRL) PowerPoint slides 11-16. These slides focused on Zimmerman’s Forethought Phase, specifically answering what is self-efficacy and explaining the importance of self-efficacy in the classroom. On the third day, the teacher modeled, discussed and had students answer questions on the Introduction to Self-Regulation Learning (SRL) PowerPoint slides 17-24. These slides focused on Zimmerman’s Performance and Self-Reflection phases. The slides provided review of
specific SRL processes and examples of classroom application, such as self-control strategies, metacognition, self-monitoring and self-evaluation.

On the fourth day, the teacher used a Goals PowerPoint (Appendix H) to model, discuss and have students practice writing Specific-Measurable-Attainable-Realistic-Timely (SMART) goals and practice completing a Progress Feedback form (Appendix L). On the fifth day, students were introduced to the SRL Resource Page (Appendix M), which provided Zimmerman’s three phase model and organized all the SRL processes into the different phases. Students also applied a Progress Feedback Form for preparing their mock trial project. On day six, one group completed a mock trial simulation that was 45 minutes long and the other part of class was focused on introducing the Executive Branch project. The PBL unit lasted five blocks and students created a project by answering the driving question, “How much power does the President have?” At the end of the class, students used the SRL Resource page to select a forethought strategy by completing a strategic planner to help them plan and think about how they are going to approach the driving question. The strategic planner (Appendix N) embedded SMART goals and it was given to the students to have them practice using this type of strategy. On the seventh day of the intervention, students began to independently practice and apply the SRL strategies to help them complete the open-ended Executive Branch driving question by using their notes, but most importantly the SRL Resource Page.

On the eighth day, the teacher reviewed Zimmerman and Moylan’s (2009) three phase model with the students and had a classroom discussion on the following prompts: What was working? What was not? Why? What changes or questions did they have
specifically about the SRL Resource Page and Progress Feedback Form? After students discussed Zimmerman and Moylan’s (2009) social-cognitive perspective of SRL cyclical model and the major processes, the teacher led an individual reflection in the class. Since SRL is context specific, students may not use the same strategies for different tasks. In addition, students usually judge their effectiveness from observations and previous experiences and outcomes. Therefore, the teacher wanted the students to first assess what was required to successfully complete the task and also monitor and reflect on the knowledge and skills required in the task. Then the students create a goal and strategic plan to accomplish it. The teacher helped walk students through the strategies they selected in their strategic plan to help them think through Zimmerman’s performance phase. In the last phase (Self-Reflection), strategic outcome monitoring occurs. Students self-reflect by linking their learning outcome to the strategic processes they used in the performance phase. The teacher encouraged the students to either adapt, abandon, or keep their strategies depending on their reflection and outcome. This reflection helped with students’ ability to self-evaluate their work, set goals and use strategies. Moreover, students received feedback from the researcher on their progress by way of short and specific feedback on the Progress Feedback Form and informal discussions during classwork. Students were able to experience the entire cyclical model at least once to learn, experience and apply the cyclical model before the current study. Previous pilot studies demonstrated that this is an important component for seventh graders to acquire the needed procedural and conditional knowledge to become self-regulated learners.
Moreover, researchers explain that students must successfully experience SRL skills before students utilize them in their daily learning (Zimmerman et al., 1996).

On the ninth day, students worked on the Executive Branch project by reviewing their goals and the SRL processes they used and planned to use. In addition, students were given a Calvin and Hobbes cartoon as an opportunity for students to take their knowledge of SRL and apply it to a similar situation they will have when they complete the business project (Appendix O). As stated previously in the SRL intervention training section, the cartoon exhibited Calvin’s lack of focus or goals, lack of self-control and poor time management. Students served as the “expert” and explained what Calvin should have done. They discussed their responses to the cartoon in small groups before having the entire class analyze the cartoon. This also allowed students to reflect on their own use of SRL in class on the current project. In addition, students practiced completing an artifact reflection form by using the SRL Resource Page and a group discussion occurred. They also briefly shared their Executive Branch project.

Data Analysis

Pre-analysis. To help with analyses, data cleaning procedures were implemented. SPSS was used to analyze the quantitative data by checking that each measure was between – two and two for skewness and kurtosis. One student was an outlier and his data was not included for the self-efficacy measures. For the qualitative data, the reflections were put into Microsoft Word. The responses were coded by the reviewers to the left of the text. The responses that could not be deciphered were
eliminated from the analysis. For example, a student’s reflection was not legible and therefore was not included.

**Data coding: RQ 1.** The first step in coding the data was all the participant project tasks were labeled with a student Identification number (birthday month and day – table #). If there was any other identification information, it was blacked out. During the study, the teacher graded the artifacts. However, to remove potential bias from the dual role as researcher and teacher, two different teachers other than the teacher and researcher graded the artifacts separately after the study. The researcher provided a 40-minute training to the teachers by reviewing the project artifact description and rubrics. After the training, the two teachers received five samples and graded them separately. They discussed the differences and agreed within 5% of four on the five samples. For the sample they disagreed on by more than 5%, they reviewed the rubric and the teachers discussed the differences with the researcher present. Then the two teachers graded the projects separately. A third reviewer was used when the two reviewers disagreed by more than 15%. The third reviewer, different than the main teacher and researcher, was trained by using the same procedures as the other two reviewers at a later time. The third reviewer’s score replaced the score that was least similar to two out of the three reviewers. After the scoring, the data were entered into SPSS and the two reviewers scores were averaged and each category were combined for a composite score. To find inter-rater reliability, the Cronbach alpha reliability statistic found the four artifacts to be .70, suggesting that the items have acceptable internal consistency (George & Mallery, 2013).
**RQ 2a.** Similar to the quantitative data, the participant project artifact reflections were labeled with a student Identification number (birthday month and day – table #) before the students received it. If there was any other identification information, it was blacked out. The data were analyzed using categorizing strategies, which means merging certain strategies into one larger SRL strategy (e.g. calendar, agenda, planning into planning) (Maxwell, 2005). Next, two teachers different than the previously mentioned teachers were taught about SRL and the Zimmerman’s three phase model by the researcher using the student SRL Resource Page (Appendix M). The teachers received the SRL Strategy Teacher Guide (Appendix P). In addition, they were taught how to identify SRL processes and code them. After the training, the two teachers completed five samples and they had an inter-rater reliability of over 85% in how they analyzed the samples. Each teacher worked independently on coding the reflections using the SRL Strategy Teacher Guide. The teacher guide was based on the SRL Resource Page given to the students. The SRL processes were taken from Zimmerman’s Self-Regulated Learning Strategies (1989) (Appendix Q). In addition, some of the SRL processes given to the students on the SRL Resource Page were shortened because they were not developmentally appropriate for seventh grade students. For example, treats were more student friendly than the SRL process of self-consequating. In the study, goals or goal-setting, calendar and strategic planner were consolidated into goal-setting and planning. The strategy of organizing and transforming was replaced with outline or organized list (O/OL) in the study. In the performance phase, environmental structuring was changed to environment and metacognitive monitoring was changed to metacognition. In addition
keeping records and monitoring was changed to self-monitoring. In the self-reflection phase, seeking social assistance was changed to help seeking. Please refer to Table 7 below to see the adaptations made in the study.

Table 7

*Adaptations to Zimmerman’s SRL Strategies (1989)*

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forethought: Goals or goal setting, calendar and strategic planner</td>
<td>Goal-setting and planning</td>
</tr>
<tr>
<td>Organizing and transforming</td>
<td>Outline or organized list (O / OL)</td>
</tr>
<tr>
<td>Performance: Self-consequating</td>
<td>Treats</td>
</tr>
<tr>
<td>Environmental structuring</td>
<td>Environment</td>
</tr>
<tr>
<td>Keeping records and monitoring</td>
<td>Self-monitoring</td>
</tr>
<tr>
<td>Self-reflection: Seeking social assistance</td>
<td>Help seeking</td>
</tr>
</tbody>
</table>

After the coding was completed, the researcher took the two reviewers coding sheets and highlighted the agreement in SRL strategies that were used except for Artifact D. Because Artifact D was answering the driving question, students completed the
reflection assignment in one class and that is why they did not complete an artifact reflection. See Table 8 for an artifact reflection inter-rater reliability.

Table 8

*Project Artifact Reflection Inter-rater Reliability*

<table>
<thead>
<tr>
<th></th>
<th>Agreement between reviewer 1 &amp; 2</th>
<th>Different SRL strategies found</th>
<th>Reliability coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Artifact Reflection A</td>
<td>114</td>
<td>33</td>
<td>78%</td>
</tr>
<tr>
<td>Project Artifact Reflection B</td>
<td>120</td>
<td>17</td>
<td>88%</td>
</tr>
<tr>
<td>Project Artifact Reflection C</td>
<td>109</td>
<td>33</td>
<td>77%</td>
</tr>
</tbody>
</table>

In most cases, the differences in SRL strategies found was that one reviewer stated a student utilized a SRL strategy and the other reviewer did not.

**RQ 2b.** Four students were selected to participate in the miroanalytic approach study. The students were selected from the 24 students who participated in the treatment group. Table 9 refers to the criteria used to select high and low achieving students in the microanalytic approach study.
**Table 9**

*Criteria for Grouping Students*

<table>
<thead>
<tr>
<th></th>
<th>High achieving students</th>
<th>Low achieving students</th>
</tr>
</thead>
<tbody>
<tr>
<td>7&lt;sup&gt;th&lt;/sup&gt; grade SOL Scores</td>
<td>Range 500 – 600</td>
<td>Range 400 – 499</td>
</tr>
<tr>
<td>GPA</td>
<td>4.0 – 4.33 (A – A +)</td>
<td>2.0 – 3.0 (C – B)</td>
</tr>
</tbody>
</table>

**Data analysis summary.** A summary of the data analysis conducted is on Table 10. For all the quantitative variables in research question one, a one-way analysis of co-variance (ANCOVA) was used three times in total to demonstrate differences between the treatment and comparison groups for the Children’s Self-efficacy for SRL, the SELF and Content Knowledge. An ANCOVA was selected because it tests the significance of group differences between two or more groups, but unlike the ANOVA it includes the co-variate that influences the dependent variable. For the Children’s Self-efficacy for SRL, the SELF and the Content Knowledge test, the covariate were the prescores and the dependent variables were the postscores. The independent variables for all three measures were the two groups (treatment and comparison). For the project artifact grades, an independent t-test was conducted to determine if there were differences between the treatment and comparison groups because there was nothing to compare for prior achievement. For research question 2a, students described what strategies they used by completing artifact reflections A-C. Two reviewers coded the artifact reflections A – C by using Zimmerman’s SRL Strategies (1989). Both reviewers had to agree on the SRL strategy used to be counted as a SRL strategy used by a student. For research
question 2b, four students (two high and two low achieving students) were analyzed by also using Zimmerman’s SRL strategies and recording the data from the Progress Feedback Forms, Project Artifacts and Project Artifact Reflections.

For research question 2a, students described what strategies they used by completing an artifact reflections A-C. Two reviewers coded the artifact reflections A –C by using Zimmerman’s SRL Strategies (1989). Both reviewers had to agree on the SRL strategy used to be counted as a SRL strategy used by a student. For research question 2b, four students (two high and two low achieving students) were analyzed by also using Zimmerman’s SRL strategies and recording the data from the Progress Feedback Forms, Project Artifacts and Project Artifact Reflections. A summary of the data analysis conducted is on Table 10.
### Table 10

**Data Analysis Summary**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Instruments</th>
<th>Scoring &amp; coding</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SE (Bandura, 2006)</td>
<td>Bandura - scale from 0% (Definitely cannot do) to 100% (Definitely can do)</td>
<td>One-way ANCOVA</td>
</tr>
<tr>
<td>1</td>
<td>SELF (Zimmerman, Kitsantas, &amp; Campillo, 2005)</td>
<td>SELF - scale from 0% (Definitely cannot do) to 100% (Definitely can do)</td>
<td>One-way ANCOVA</td>
</tr>
<tr>
<td>1</td>
<td>Project Artifacts (Dippold, 2013)</td>
<td>Four project artifacts worth a total of 150 points total – Each tasks has different categories that are graded from 0 to 5 points and converted to a percentage</td>
<td>Independent t-test</td>
</tr>
<tr>
<td>1</td>
<td>Content Knowledge Test (Dippold, 2013)</td>
<td>20 multiple choice questions (each question worth 5%) for a total score out of 100%</td>
<td>One-way ANCOVA</td>
</tr>
<tr>
<td>2 b</td>
<td>Artifact Reflections (Dippold, 2012); Progress Feedback Form (Dippold, 2012)</td>
<td>4 students selected for case study</td>
<td>Microanalytic Approach (Cleary, 2011)</td>
</tr>
</tbody>
</table>
Validity and Reliability

Since the researcher was serving a dual role as the teacher, there were many actions taken to ensure validity of the results and a reliable study. As the researcher, students were told the aim of the study as stated on their assent form and that their decision to participate or not participate had no influence on their grades or relationship with the teacher. The researcher passed out the assent and consent forms to the students, but the forms were turned-in to another teacher, a third party, so the researcher would not know whether a student agreed to participate, to help minimize the possibility of coercion.

The paraprofessional or co-teacher checked to make sure the instruments were used with fidelity by observing both groups when using the instruments. Two teachers also graded all students’ work. The teachers received a 40-minute training on how to use the rubrics to grade the projects and had an opportunity to grade a few other projects in another class for practice. To protect student identity, each student had a special identification number so the other teachers were not aware of the students' work. This helped to avoid any potential bias of evaluating and grading students during the enrollment in the study. Students will be offered a brief summary of the important findings of the study in which they have participated, should they request it.
CHAPTER FOUR

The overall purpose of this quasi-experimental study was to better understand whether differences existed between students who received SRL instruction and students who did not in regards to self-efficacy, project artifact achievement and content knowledge in a PBL unit. The study also examined what self-regulatory strategies students most frequently used during the unit in the treatment group and provided a microanalytic approach study of four students’ self-regulatory functioning in a project-based learning environment. The results are broken into sub-sections which include descriptive statistics and the findings for each research question.

Preliminary Analyses

To see if there were achievement differences between the groups, independent t-tests were conducted on the state standardized tests for 7th grade SOL scores. The results indicated that there were not significant differences between the groups in 7th grade scores in Reading comparison group $M = 474.93$, $SD = 31.54$ and Civics $M = 514.21$, $SD = 46.92$ compared to the treatment scores of Reading $M = 485.42$, $SD = 55.62$ and Civics $M = 508.92$, $SD = 53.68$. Therefore, it was assumed that there are no major differences between the comparison and treatment groups in prior achievement based on the state testing scores. Refer to Table 11 for the means and standard deviations on SOL scores.
Table 11

SOL Scores

<table>
<thead>
<tr>
<th>Measures</th>
<th>Treatment M (SD)</th>
<th>Comparison M (SD)</th>
<th>T</th>
<th>Df</th>
<th>sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th SOL Civics</td>
<td>508.9 (53.7)</td>
<td>514.2 (46.9)</td>
<td>.44</td>
<td>50</td>
<td>.66</td>
</tr>
<tr>
<td>7th SOL Reading</td>
<td>474.9 (31.5)</td>
<td>485.4 (55.6)</td>
<td>-.92</td>
<td>50</td>
<td>.36</td>
</tr>
</tbody>
</table>

Descriptive Statistics and Correlation Analyses

The statistics in this section are related to the quantitative variables for both the comparison and the treatment groups. Table 12 demonstrates the various correlations of the quantitative variables for both groups.
Table 12

Correlations of Achievement & Self-Regulatory Processes

<table>
<thead>
<tr>
<th></th>
<th>1 SOL 7th Civics</th>
<th>2 SOL 7th Reading</th>
<th>3 Children’s S-E SRL Post</th>
<th>4 SELF Post</th>
<th>5 Artifact A</th>
<th>6 Artifact B</th>
<th>7 Artifact C</th>
<th>8 Artifact D</th>
<th>9 CK Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SOL 7th Civics</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 SOL 7th Reading</td>
<td>.67**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Children’s S-E SRL Post</td>
<td>.30*</td>
<td>.23</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 SELF Post</td>
<td>.31*</td>
<td>.15</td>
<td>.78**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Artifact A</td>
<td>.38**</td>
<td>.30*</td>
<td>.32**</td>
<td>.27</td>
<td>.44*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Artifact B</td>
<td>.30*</td>
<td>.20</td>
<td>.21</td>
<td>.26</td>
<td>.44*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Artifact C</td>
<td>.17</td>
<td>.19</td>
<td>.28</td>
<td>.18</td>
<td>.33*</td>
<td>.23</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Artifact D</td>
<td>.46**</td>
<td>.59**</td>
<td>.17</td>
<td>.09</td>
<td>.46*</td>
<td>.32*</td>
<td>.43</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>9 CK Test</td>
<td>.50**</td>
<td>.52</td>
<td>.12</td>
<td>.26</td>
<td>.41*</td>
<td>.29*</td>
<td>.16</td>
<td>.25</td>
<td>-</td>
</tr>
</tbody>
</table>

*p < .05
**p < .001

Note. SOL = Standards of learning (state test); S-E SRL = Self-efficacy for self-regulated learning; SELF = Self-efficacy learning form; CK = Content knowledge

When examining Table 12, two variables of particular interest are the SELF and Children’s Self-efficacy for Self-Regulated Learning (CSESRL) scale, which focus on how confident the students are in completing a specific task (cannot do at all (0%) to highly certain (100%)). For the Children’s Self-efficacy for SRL Post, the highest correlation was with the SELF Post at $r = .78$, $p < .01$. Not surprisingly, the results suggest that students with high self-efficacy on Children’s S-E SRL scale have high self-
efficacy on the SELF as well. Children’s S-E SRL scale correlated significantly with Project Artifact A, $r = .32, p < .001$. Similarly, the SELF scale correlated significantly with SOL Civics $r = .31, p < .05$. The post Content Knowledge Test was significantly correlated with Civics SOL $r = .50, p < .05$, Project Artifact A $r = .41, p < .05$, and Project Artifact B $r = .29, p < .05$. The SOL tests are also correlated with Project Artifact A and B and they are based on the lessons students’ learned during the Business unit. Project Artifact A has a positive and significant correlation with SOL 7th grade Reading $r = .30, p < .05$, SOL 7th grade Civics $r = .38, p < .001$ and Children’s S-E SRL Post $r = .32, p < .001$ and Project Artifact A $r = .44, p < .001$. In addition, Project Artifact B has a positive and significant correlation with SOL 7th grade Civics $r = .30, p < .05$.

**Research question 1 results.** Are there differences between the treatment and the comparison groups in students’ self-efficacy beliefs for self-regulated learning, self-efficacy, project artifact achievement and content knowledge test?

To examine whether differences existed between the comparison and treatment groups, there were three ANCOVA tests run on self-efficacy beliefs for self-regulated learning, self-efficacy learning form (SELF) and content knowledge. The assumptions of the ANCOVA were tested and met. Table 13 shows that the Self-efficacy for Self-regulated Learning had no significant differences found between the groups $F(1, 50) = 1.61, p = .18$ but the SELF had significant differences found between the groups $F(1, 50) = 2.67, p = .02$. Similar to the Children’s Self-efficacy for Self-regulated learning, content knowledge showed no significant differences between the groups $F(1, 50) = 4.72, p = .33$. For almost all variables, the treatment group had a higher mean score, but the
SELF was the only measure where the treatment group was statistically significantly higher than the comparison group. The Cohen’s d calculated the measure of effect size for group mean differences. The effect size for the Children’s Self-efficacy for Self-regulated learning is considered small (.36), but the content knowledge (.46) and the SELF (.61) are considered medium (Cohen, 1988). Refer to Table 13 for a summary of the self-efficacy and content knowledge findings.

Table 13

<table>
<thead>
<tr>
<th></th>
<th>Treatment M (SD)</th>
<th>Comparison M (SD)</th>
<th>Df</th>
<th>Sig.</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children’s S-E SRL</td>
<td>82.56 (8.62)</td>
<td>78.84(11.81)</td>
<td>50</td>
<td>.18</td>
<td>.36</td>
</tr>
<tr>
<td>SELF</td>
<td>80.91 (9.8)</td>
<td>76.34 (10.0)</td>
<td>50</td>
<td>.02</td>
<td>.46</td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>84.78 (14.1)</td>
<td>76.25(13.7)</td>
<td>49</td>
<td>.33</td>
<td>.61</td>
</tr>
</tbody>
</table>

There were four project artifacts (Appendix C) completed during the unit, and Table 14 shows for project artifact A the treatment score $M = 12.14, SD = 1.52$ was higher than the comparison group $M = 11.56, SD = 1.59$ but the findings demonstrated no statistically significant differences based on the t-test analysis. Similar results were found with Artifact B where the treatment group scored $M = 8.56, SD = .94$ and the comparison group scored $M = 8.11, SD = 1.08$. Project Artifact A and B were focused on
applying the business concepts from class and creating an artifact to sell a product at Business Day. Project Artifact C and D scores did not show much difference with the comparison group on Project Artifact C having a $M = 24.52$, $SD = 2.43$ compared to the treatment group of $M = 24.29$, $SD = 2.63$. On Project Artifact D, where students completed the reflection including answering the driving question, comparison score was $M = 16.83$, $SD = 1.30$ and the treatment score was $M = 16.48$, $SD = 1.79$. In addition, both Artifact C and D were not statistically significant. The smaller standard deviation score in Artifact D and a higher comparison score could be attributed to that students only had one class to complete the project artifact reflection. In addition, project artifact D was a reflection instead of students creating a product for their project, which could be a reason for students not applying SRL strategies learned during the unit.
Table 14

*Project Artifact Scores*

<table>
<thead>
<tr>
<th>Measures</th>
<th>Treatment M (SD)</th>
<th>Comparison M (SD)</th>
<th>t</th>
<th>Df</th>
<th>sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Artifact A</td>
<td>12.14 (1.52)</td>
<td>11.56 (1.59)</td>
<td>-1.56</td>
<td>48</td>
<td>.12</td>
</tr>
<tr>
<td>Project Artifact B</td>
<td>8.56 (.94)</td>
<td>8.11 (1.08)</td>
<td>-1.85</td>
<td>48</td>
<td>.07</td>
</tr>
<tr>
<td>Project Artifact C</td>
<td>24.29 (2.63)</td>
<td>24.52 (2.43)</td>
<td>.36</td>
<td>46</td>
<td>.72</td>
</tr>
<tr>
<td>Project Artifact D</td>
<td>16.48 (1.79)</td>
<td>16.83 (1.30)</td>
<td>.87</td>
<td>48</td>
<td>.39</td>
</tr>
</tbody>
</table>

**Research question 2a results.** The research question was “How do middle school students apply SR processes in a SRL infused PBL environment?”

To answer the question, there were four open ended questions that the treatment group was given in a project artifact reflection (Appendix E) immediately before turning in their Project Artifacts A, B, and C. The questions went in the same order as Zimmerman and Moylan’s (2009) Self-regulation learning three phase model, but students also reflected on their action plan. The action plan stated, “Based on your self-reflection response, describe your plan of action (what you will do this week or weeks ahead) to continue your current progress or change to improve your work.” A total of 23 students wrote three project artifact reflections for a total of 67 responses with two students being absent for them.

The top two strategies from the treatment group participants from each phase are found in Tables 16-18, 20-22, 24-26, and 28-30. Strategies are the way students use the
SRL processes for their academic learning (e.g. work on the project). The two teacher reviewers labeled all the responses according to what SRL strategy was used. The researcher selected all responses that explained how the participant used the strategy for their project and did not include repeated statements from multiple participants. The comments were not altered and they are the participant responses.

**Forethought.** Forethought is the first phase in the model and it focuses on goal setting and strategic planning and on the motivational strategies that set the stages for learning. The two main forethought processes are task analysis and self-motivation beliefs. Task analysis includes goal setting and strategic planning which help a learner create a plan. Self-motivational beliefs are self-efficacy, intrinsic interest and learning goal orientation which all relate to students’ beliefs about the learning experience and environment. The students in the treatment group were taught the Forethought phase which had numerous strategies they could employ to help them with their project including using SMART goals, calendars and planning documents.

After the two reviewers coded the results from the Forethought Phase shown in Table 15, three SRL strategies emerged as the most frequently used.
Table 15

*Frequency and Percentages of Strategies Used in the Forethought Phase*

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Project artifact reflection a</th>
<th>Project artifact reflection b</th>
<th>Project artifact reflection c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal-Setting and Planning</td>
<td>15(71%)</td>
<td>11(43%)</td>
<td>11(43%)</td>
</tr>
<tr>
<td>Organizing and transforming</td>
<td>7(33%)</td>
<td>7(30%)</td>
<td>12(52%)</td>
</tr>
<tr>
<td>Selecting Strategy</td>
<td>3(14%)</td>
<td>5(24%)</td>
<td>1(4%)</td>
</tr>
</tbody>
</table>

The first strategy utilized was planning which was used 15 times in Project Artifact Reflection A, 11 times in Project Artifact Reflection B and then 11 times in Project Artifact Reflection C. While categorizing the data, key terms such as “calendar”, “schedule”, “strategic planner”, “weekly agenda”, “SMART goals” were consolidated into the key term planning. One student stated, “Calendar - I think I used a calendar well to put when different parts of the assignment were due. “Brainstorming - I think brainstorming questions with Artifact B, helped me do the assignment better.” Another student stated, “I set realistic goals that would be a challenge to complete in a certain number of minutes. The goals were hard but not impossible. I used my planner well. I felt good about my ability to do well on the project.” Tables 16-18, 20-22, 24-26, and 28-30 has project artifact reflection statements from participants from the treatment group that focused on the Forethought Phase.
### Table 16

*Forethought Phase Project Artifact A Reflection Statements*

<table>
<thead>
<tr>
<th>Category</th>
<th>Reflection Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal setting and planning</strong></td>
<td>I made a strategic planner because it helped me plan out what I was going to do. To give myself breaks and I had a schedule for myself. I looked at the rubric and thought what I should do. Then I wrote down each question on a sheet and answered them. … we created a plan on Google Drive to organize our thoughts. … I also put all of the due dates in my agenda so I know when I had to get things done.</td>
</tr>
<tr>
<td><strong>Organizing and transforming</strong></td>
<td>I made a list of the stuff that I needed and stuff I already had. I did well b/c I followed my plan correctly. I made a checklist to make things like survey[..] I thought about how I would organize my thoughts. I researched online and created a survey to see what the people want. I used a to do list and put down everything I needed to do to complete the project.</td>
</tr>
</tbody>
</table>
Table 17

*Forethought Phase Project Artifact B Reflection Statements*

<table>
<thead>
<tr>
<th>Goal setting and planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I planned out my time in my agenda and used the planner we made in class</td>
</tr>
<tr>
<td>I read the rubric over a few times to understand what I’m doing and kind of visualize...how I’m making the Budget. I made a list of materials I need and a checklist on how and where I am going to write how much they cost. Answered the questions that the whole class wrote down</td>
</tr>
<tr>
<td>I made a realistic plan to motivate myself to get myself to finish my tasks for 1 hour</td>
</tr>
<tr>
<td>Calendar – I think I used a calendar well to put when different parts of the assignment were due. Brainstorming – I think brainstorming questions with Artifact B, helped me do the assignment better</td>
</tr>
<tr>
<td>I thought out what I was going to buy and make and it helped me visualize the end product</td>
</tr>
<tr>
<td>I did a little everyday. I started as soon as I got the project and didn’t procrastinate (sic)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organizing and transforming</th>
</tr>
</thead>
<tbody>
<tr>
<td>I planned out my time in my agenda and used the planner we made in class</td>
</tr>
<tr>
<td>I read the rubric over a few times to understand what I’m doing and kind of visualize...how I’m making the Budget. I made a list of materials I need and a checklist on how and where I am going to write how much they cost. Answered the questions that the whole class wrote down</td>
</tr>
<tr>
<td>I made a realistic plan to motivate myself to get myself to finish my tasks for 1 hour</td>
</tr>
<tr>
<td>Calendar – I think I used a calendar well to put when different parts of the assignment were due. Brainstorming – I think brainstorming questions with Artifact B, helped me do the assignment better</td>
</tr>
<tr>
<td>I thought out what I was going to buy and make and it helped me visualize the end product</td>
</tr>
<tr>
<td>I did a little everyday. I started as soon as I got the project and didn’t procrastinate (sic)</td>
</tr>
<tr>
<td>I took the rubric and thought about what to do I need to do in order to meet the requirements to do my best (metacognition).</td>
</tr>
</tbody>
</table>
Table 18

*Forethought Phase Project Artifact C Reflection Statements*

<table>
<thead>
<tr>
<th>Goal setting and planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I planned I brainstormed what materials I needed to get what I already have, I also made a plan to see what the poster would look like</td>
</tr>
<tr>
<td>Planning out my project beforehand by making a rough draft and asking peoples’ opinions and tweaking it as I received their opinions</td>
</tr>
<tr>
<td>I made a mental note to myself what will I need for my Artifact C and made RD’s on what my Artifact C looked like and asked my friends which one looked better to focus on.</td>
</tr>
<tr>
<td>I looked at a couple of examples of small business advertisements and I found a picture of a mini oreo pudding pie to design my advertisement around</td>
</tr>
<tr>
<td>I practiced my presentation, set up my stand at home to make sure it looked okay. Also, the strategic planner really helped me organize my thoughts</td>
</tr>
<tr>
<td>Strategic Planner – The sheet helped me clearly see what I had to do and had to get to complete Artifact C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organizing and transforming</th>
</tr>
</thead>
<tbody>
<tr>
<td>I made a list of the things I needed to buy. I also sketched out an actual rough draft which was very detailed. The rough draft helped me visualize the project and think about how I will meet my goal</td>
</tr>
<tr>
<td>I made a to-do list and a picture to help me complete this project</td>
</tr>
<tr>
<td>Made a graphic outline and a check list</td>
</tr>
<tr>
<td>The strategies that worked out well for me…managing my time w/ a list of things to do. These strategies make me meet goal at the end</td>
</tr>
<tr>
<td>I created a To Do list. This helped me stay organized and on task.</td>
</tr>
<tr>
<td>I made a to-do list and it helped me stay on task + complete my website with all the needed information</td>
</tr>
<tr>
<td>A to-do list. It helped me remember what I had and hadn’t done. This really helped me stay on task.</td>
</tr>
</tbody>
</table>
Performance. The Performance phase includes the two major processes of self-observation and self-control. The students in the treatment group were taught the Performance phase and had numerous strategies they could employ to help them with their project including using self-monitoring, task strategies, self-instruction, imagery and environment. The results from Table 19 show that the most often used strategy was finding an appropriate environment by moving away from distractions and seeking a quiet area that was conducive to completing rigorous projects.

Table 19

*Frequency and Percentages of Strategies Used in the Performance Phase*

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Project artifact reflection a</th>
<th>Project artifact reflection b</th>
<th>Project artifact reflection c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental structuring</td>
<td>13(62%)</td>
<td>9(39%)</td>
<td>10(43%)</td>
</tr>
<tr>
<td>Imagery</td>
<td>2(10%)</td>
<td>1(4%)</td>
<td>4(17%)</td>
</tr>
<tr>
<td>Metacognitive monitoring</td>
<td>3(14%)</td>
<td>1(4%)</td>
<td>0%</td>
</tr>
<tr>
<td>Self-Instruction</td>
<td>3(14%)</td>
<td>2(9%)</td>
<td>1(4%)</td>
</tr>
<tr>
<td>Keeping records and monitoring</td>
<td>6(29%)</td>
<td>7(30%)</td>
<td>4(17%)</td>
</tr>
<tr>
<td>Self-consequating</td>
<td>7(33%)</td>
<td>9(39%)</td>
<td>6(30%)</td>
</tr>
<tr>
<td>Task Strategies</td>
<td>6(29%)</td>
<td>7(30%)</td>
<td>9(39%)</td>
</tr>
</tbody>
</table>

The environmental structuring strategy was used by 13 students during Artifact Reflection A, nine times in Artifact Reflection B and 10 times in Project Artifact Reflection C. In total, 48% of students who used a strategy during the Performance phase in Artifacts A – C used managing their environment in this project. For example, a
student stated, “I removed myself from the distractions of other classmates.” The second most frequently used strategy was self-consequating which means giving themselves treats or rewards for achieving desired goals or outcomes. For example, one student stated “To help me work well, I used treats to motivate me…” The use of treats was consistent throughout the project artifact reflections completed. For example, self-consequating was used seven times in Project Artifact Reflection A, nine times in Project Artifact Reflection B and six times in Project Artifact Reflection C for approximately 34% of students using this SRL strategy during the unit. See Tables 20-22 for statements from participants during the Performance phase.
Table 20

*Performance Phase Artifact A Reflection Statements*

<table>
<thead>
<tr>
<th>Environmental Structuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>To help me work well…I moved away from distraction.</td>
</tr>
<tr>
<td>I went to the library so that I could move away from distractions</td>
</tr>
<tr>
<td>Also I moved away from distractions so that I wouldn’t get distracted from electronics.</td>
</tr>
<tr>
<td>I moved into my room &amp; closed my door. I had my family be quiet while I was typing.</td>
</tr>
<tr>
<td>Environment – I made sure to only have my PowerPoint open, and to close my email and google so there was less of a chance I would get of (sic) task and more of a chance that I would focus.</td>
</tr>
<tr>
<td>I tried to minimize my distractions for a better environment.</td>
</tr>
<tr>
<td>I blocked websites that I know would get me off task…</td>
</tr>
<tr>
<td>…did not talk to people while working.</td>
</tr>
<tr>
<td>I turned my ipod completely off.</td>
</tr>
<tr>
<td>I also made sure I was working in a good working environment with little or no distractions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-Consequating</th>
</tr>
</thead>
<tbody>
<tr>
<td>To help me work well, I used treats to motivate me.</td>
</tr>
<tr>
<td>I also gave myself a treat every 30 minutes I worked hard.</td>
</tr>
<tr>
<td>I used treats so I would get…everything done.</td>
</tr>
<tr>
<td>Did a little bit of the proj. each day…Used treats to motivate (chocolate)</td>
</tr>
<tr>
<td>…I said to myself that I’ll (sic) can go to the internet if I finish a good part of my project.</td>
</tr>
<tr>
<td>I gave myself a phone break every 10 min…Did not use my phone when I wasn’t supposed to (use a lot of self control)</td>
</tr>
<tr>
<td>I used a reward system, complete task 1 get 10 min. on another site.</td>
</tr>
</tbody>
</table>
Table 21

*Performance Phase Artifact B Reflection Statements*

<table>
<thead>
<tr>
<th>Environmental structuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>I moved to a quieter environment so I was not tempted to talk to family members.</td>
</tr>
<tr>
<td>I moved myself from distractions and took breaks every 15 minutes to space out the work. I also reward myself.</td>
</tr>
<tr>
<td>I moved away from distractions (sic) to complete my goal</td>
</tr>
<tr>
<td>Environment – I sat in a good place where I wouldn’t get distracted and could get my work done.</td>
</tr>
<tr>
<td>I used self-monitoring sheets + minimized distractions.</td>
</tr>
<tr>
<td>…I moved away from the distraction of my little brother.</td>
</tr>
<tr>
<td>I moved away from my ipod.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self consequating</th>
</tr>
</thead>
<tbody>
<tr>
<td>I motivated myself by saying “if you finish it now you will have more time to do something else”.</td>
</tr>
<tr>
<td>I rewarded myself if I finished the task and met the goals I set for myself. I also told myself I would have free time if I finished it.</td>
</tr>
<tr>
<td>I gave myself a reward (eating cookies) when I finished.</td>
</tr>
<tr>
<td>I used treats to after I finished my artifact A I treated myself to watch some t.v.</td>
</tr>
<tr>
<td>I said to myself, that if I figure out the prices and figured out the calculations I can watch one episode of an anime.</td>
</tr>
</tbody>
</table>
Table 22

Performance Phase Artifact C Reflection Statements

<table>
<thead>
<tr>
<th>Environmental structuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>I focused well and moved away from distractions (sic).</td>
</tr>
<tr>
<td>I pictured what I was making on my poster in [teacher’s room] and the 5th graders pointing to it. I closed my door and got to work.</td>
</tr>
<tr>
<td>I didn’t let any noise or distractions distract me so that I finished.</td>
</tr>
<tr>
<td>I moved away from distractions.</td>
</tr>
<tr>
<td>I removed myself from the distractions of other classmates.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self consequating</th>
</tr>
</thead>
<tbody>
<tr>
<td>I took breaks in between working and had music in the background to make it enjoyable.</td>
</tr>
<tr>
<td>…I rewarded myself with 10 minutes of T.V. for 30 minutes of work on my poster</td>
</tr>
<tr>
<td>I told myself that once I finished the poster, I could watch U.S. vs Germany game. I worked hard to complete the task.</td>
</tr>
<tr>
<td>I used treats to motivate myself to get one thing down after another.</td>
</tr>
<tr>
<td>I used a reward system. 15 minutes of work = 5 minute rest time.</td>
</tr>
<tr>
<td>I realized I was getting tired or I did not really want to do the assignment, but I gave myself a pep talk and I told myself I had made it this far, I shouldn’t give up now. I also played some music which really got me excited and kept me going.</td>
</tr>
</tbody>
</table>

Self-reflection. Zimmerman’s last phase is self-reflection and its components are self-judgment and self-reactions. One important form of self-judgment is self-evaluation which is comparing self-observed performance to a standard, such as a rubric or previous performance (Zimmerman, 2002). The students in the treatment group were taught the
Self-reflection phase which had numerous strategies they could employ to help them with their project including causal attributions, seeking social assistance, self-evaluating, keeping records and monitoring and self-reaction. Table 23 results show that the most used strategies were casual attributions which are when students explain the cause or reason for their work.

Table 23

*Frequency and Percentages of Strategies Used in the Self-Reflection Phase*

<table>
<thead>
<tr>
<th>Measures</th>
<th>Project artifact reflection a</th>
<th>Project artifact reflection b</th>
<th>Project artifact reflection c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causal Attribution</td>
<td>8(38%)</td>
<td>13(57%)</td>
<td>13(57%)</td>
</tr>
<tr>
<td>Environmental structuring</td>
<td>1(5%)</td>
<td>0(%)</td>
<td>0(%)</td>
</tr>
<tr>
<td>Seeking social assistance</td>
<td>3(14%)</td>
<td>1(4%)</td>
<td>2(9%)</td>
</tr>
<tr>
<td>Selecting Strategy</td>
<td>5(24%)</td>
<td>2(9%)</td>
<td>6(26%)</td>
</tr>
<tr>
<td>Self-Evaluating</td>
<td>3(14%)</td>
<td>4(17%)</td>
<td>4(17%)</td>
</tr>
<tr>
<td>Keeping records and monitoring</td>
<td>0(0%)</td>
<td>4(17%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Self-Reaction</td>
<td>3(14%)</td>
<td>3(14%)</td>
<td>2(9%)</td>
</tr>
<tr>
<td>Task Strategies</td>
<td>0(0%)</td>
<td>1(4%)</td>
<td>1(4%)</td>
</tr>
</tbody>
</table>

The students used them eight times in Project Artifact Reflection A, 13 times in Project Artifact Reflection B and 13 times in Project Artifact Reflection C for a total of 51% of all students. The students explained a full spectrum of reasons from why they produced high quality work to not putting in enough effort to do their best work. This is an important component of SRL because it highlights for students the reason why something worked or did not. For example, a student stated, “I did achieve my goal, and I stuck to
my plan, which I am proud of. I met all the requirements.” In addition, students can change their behavior if they understand what they did not do well on, or they can maintain the same effort and strategy use if they succeeded. Another student stated, “…it didn’t turn out the way I wanted to. Next time, I should seek help from others such as a teacher or parents.” Another significantly used strategy was using a selecting strategy (19% of the time), which means the student reflects on a strategy that they can use in the future to help them with their project. One example is “[T]o achieve even more though I could have been a bit better at managing my time.” See Table 24-26 for project artifact reflection statements from participants during the Self-reflective phase.

Table 24

**Self-reflective Phase Project Artifact A Reflection Statements**

<table>
<thead>
<tr>
<th>Casual Attribution</th>
<th>Selecting Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I achieved my goal b/c I followed the rubric and I made good use of my time.</td>
<td>I sort of achieved my goal because I completed the project but it was not what I wanted so I am turning it in when I fell (sic) good about it.</td>
</tr>
<tr>
<td>No, not at all [did I achieve my goal]. I had absolutely no idea what I was going to make when I started. I didn’t know whether to make paragraphs, surveys or a PPT (still don’t).</td>
<td>I finished my work faster because I planned what I was going to do.</td>
</tr>
<tr>
<td>Yes. The project (Artifact A) was completed. I used my time efficiently and had a constant end-goal in mind.</td>
<td>[T]o achieve even more though I could have been a bit better at managing my time.</td>
</tr>
</tbody>
</table>

I did not use my time wisely I often got distracted when looking for inspiration (sic) from online bow company’s.
Table 25

*Self-reflective Phase Project Artifact B Reflection Statements*

<table>
<thead>
<tr>
<th>Causal attribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>I achieved my goal bc I finished the project on time and I made it detailed.</td>
</tr>
<tr>
<td>Yes, I achieved it by using accurate facts and thinking of what my business will be like I visualized.</td>
</tr>
<tr>
<td>I did achieve my goal because I made a budget sheet with all the items on it + stayed on task the whole time.</td>
</tr>
<tr>
<td>Yes I completed my tasks in the period of time given and even had time to improve my product.</td>
</tr>
<tr>
<td>Yes, I did achieve my goal because after I had done my best I used the questions in the front we brainstormed in class to see if I answered them and I also used my self-monitoring sheet and rubric.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selecting a strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes because I really worked hard and then gave myself a reward and that really worked for me.</td>
</tr>
</tbody>
</table>
### Table 26

**Self-reflective Phase Project Artifact C Reflection Statements**

<table>
<thead>
<tr>
<th><strong>Causal attribution</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I achieved my goal because I worked hard on the project.</td>
<td></td>
</tr>
<tr>
<td>I did achieve my goal by working well.</td>
<td></td>
</tr>
<tr>
<td>I achieved my goal because I wanted my poster to draw more attention to me and my products. I was glad and surprised when I only had 6-7 bows left when the 5th graders left.</td>
<td></td>
</tr>
<tr>
<td>I achieved my goal because the 5th graders came to my product and bought it.</td>
<td></td>
</tr>
<tr>
<td>I did manage to complete my goal, I used my time properly but I think I still need to ask someone such as a friend to look it so I can improve on it.</td>
<td></td>
</tr>
<tr>
<td>Yes. My poster was complete and met the requirements, I can thank “using my time well” for this by using a To Do list.</td>
<td></td>
</tr>
<tr>
<td>I achieved my goal, I used time wisely and used the checklist the only thing I would’ve changed was adding more buzz words.</td>
<td></td>
</tr>
<tr>
<td>I achieved my goal because I made a website that had multiple reasons for why you should come to my store and buy my product.</td>
<td></td>
</tr>
<tr>
<td>I did achieve my goal because I followed my rough draft on how I wanted my poster to look like. I also evaluated my project while using the rubric and it fit all the criteria. In the future, I will fix errors like spelling someone’s name wrong</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Selecting a strategy</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I achieved my goal and the poster looked as I had planned it. I would have changed the pictures and I had a mis-spelling.</td>
<td></td>
</tr>
<tr>
<td>I achieved my goal b/c I made my poster look exactly like my plan.</td>
<td></td>
</tr>
<tr>
<td>I believed I have achieved my goal partially because even though I didn’t reach my estimated revenue I believe that given the fact that our class that came to us didn’t really buy any ones product I believe we did quite well.</td>
<td></td>
</tr>
<tr>
<td>If I could do this again I would make the flyers bigger and make flasher</td>
<td></td>
</tr>
<tr>
<td>Yes, and for the most part I stayed on track. I will continue making to-do lists for studying + such.</td>
<td></td>
</tr>
</tbody>
</table>
**Cyclical feedback loop: action plan.** The action plan represents the cyclical feedback loop learners engage as they prepare for the next course of action in the forethought phase. The action plan is inherent due to the cyclical nature of the model, but the researcher desired to have students explicitly write down their actions and thoughts. In other words, the action plan was intended to have students reflect on their project artifact reflection and decide what they need to keep or change as they continue to work on their Business project. According to Table 27, the planning strategy was most used by 24 students in total including seven times in Project Artifact Reflection A, 13 times in Project Artifact Reflection B and four times in Project Artifact Reflection C. These results suggest that students will start or continue to use planning strategies to help them in their work on the various project artifacts of the business project. For example, a student stated, “I will plan out…the finished product first & Review the rubric.” Refer to Table 27 for the frequency and percentages of strategies used in the action plan phase.
Table 27

*Frequency and Percentages of Strategies Used in the Action Plan Phase*

<table>
<thead>
<tr>
<th>Measures</th>
<th>Project artifact reflection a</th>
<th>Project artifact reflection b</th>
<th>Project artifact reflection c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental structuring</td>
<td>1(3%)</td>
<td>0%</td>
<td>2(9%)</td>
</tr>
<tr>
<td>Seeking social assistance</td>
<td>5(24%)</td>
<td>2(9%)</td>
<td>2(9%)</td>
</tr>
<tr>
<td>Imagery</td>
<td>1(4%)</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Selecting strategy</td>
<td>3(14%)</td>
<td>3(13%)</td>
<td>6(26%)</td>
</tr>
<tr>
<td>Organizing and transforming</td>
<td>0%</td>
<td>1(4%)</td>
<td>1(4%)</td>
</tr>
<tr>
<td>Goal-setting and Planning</td>
<td>7(33%)</td>
<td>13(57%)</td>
<td>4(17%)</td>
</tr>
<tr>
<td>Self-Evaluating</td>
<td>1(4%)</td>
<td>3(14%)</td>
<td>0%</td>
</tr>
<tr>
<td>Keeping records and monitoring</td>
<td>4%</td>
<td>3(14%)</td>
<td>1(4%)</td>
</tr>
<tr>
<td>Self-consequating</td>
<td>1(4%)</td>
<td>2(9%)</td>
<td>0%</td>
</tr>
<tr>
<td>Task Strategies</td>
<td>1(4%)</td>
<td>1(4%)</td>
<td>3(13%)</td>
</tr>
</tbody>
</table>

The next strategy utilized was called selecting strategy which was used three times in Project Artifact Reflection A, three times in Project Artifact Reflection B and six times in Project Artifact Reflection C. For example, one student used selecting a strategy stating, “I will keep the same plan of action b/c using this plan I achieved my goal.” See Tables 28 -30 for project artifact reflection statements from participants during the Self-reflective phase.
<table>
<thead>
<tr>
<th>Goal setting and planning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Next time, I will plan to use my time better and I will also continue to use my agenda and move myself from distractions.</td>
<td></td>
</tr>
<tr>
<td>I will do everything I did this time because it worked out pretty well.</td>
<td></td>
</tr>
<tr>
<td>Re-read things – Next time, I will re-read my project more so it makes sense. I will also re-read the directions so I know what I am doing.</td>
<td></td>
</tr>
<tr>
<td>I would continue to do the things that worked well from the above section, and change the others.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selecting a strategy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I will make sure to use the same things so I finish faster.</td>
<td></td>
</tr>
<tr>
<td>I will do the same thing but will spend more [time] on the forethought phase.</td>
<td></td>
</tr>
<tr>
<td>I will continue to self-monitor and plan ahead which has been helping me.</td>
<td></td>
</tr>
<tr>
<td>Continue to stay on task, manage my time well.</td>
<td></td>
</tr>
<tr>
<td>I will set aside more time. I will moniter (sic) my work more often. I will continue to seek help.</td>
<td></td>
</tr>
</tbody>
</table>
Table 29

*Action Plan Phase Artifact B Reflection Statements*

<table>
<thead>
<tr>
<th>Goal setting and planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I will plan ahead more and set break times.</td>
</tr>
<tr>
<td>I will use the same plan next time, b/c it worked well this time.</td>
</tr>
<tr>
<td>I plan to focus more on my work.</td>
</tr>
<tr>
<td>Well, since that really worked for me, I will do that again for artifact c.</td>
</tr>
<tr>
<td>I will make sure that I understand what I need to do and get it done on time.</td>
</tr>
<tr>
<td>I will plan out…the finished product first &amp; Review the rubric.</td>
</tr>
<tr>
<td>I will continue making agendas so I can finish my work without feeling rushed.</td>
</tr>
<tr>
<td>I think that it worked well, and I would use the rubric and self-monitoring checklist again.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selecting a strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I will continue to do what I am already doing right now but, I will also make a goal chart/checklist to be more efficient/organized.</td>
</tr>
<tr>
<td>Next time, I will try to add more information about my topic.</td>
</tr>
<tr>
<td>I will make sure that I understand what I need to do and get it done on time.</td>
</tr>
<tr>
<td>I plan to focus more on my work.</td>
</tr>
<tr>
<td>For the weeks to come I will work on Artifact C and creating my product.</td>
</tr>
<tr>
<td>I will continue to use self control and not procrastinate.</td>
</tr>
<tr>
<td>I will continue to do what I am already doing right now but, I will also make a good chart/checklist to be more efficient/organized.</td>
</tr>
</tbody>
</table>
Table 30

*Action Plan Phase Artifact C Reflection Statements*

<table>
<thead>
<tr>
<th>Goal setting and planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>For artifact D I will create a checklist and a strategic planer (sic).</td>
</tr>
<tr>
<td>In the future I will continue to use my time wisely and set goals.</td>
</tr>
<tr>
<td>I will set small due dates for myself so I know I completed everything.</td>
</tr>
<tr>
<td>I will continue to plan ahead, monitor my work, and seek help when I need it.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selecting a strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>I will take the results that I got from this project take them, and will analyze and create a smarter way to market, instead of setting my revenue and profit so high, there would be now a lower and more reasonable goal based on this projects results.</td>
</tr>
<tr>
<td>…Checklists always help me.</td>
</tr>
<tr>
<td>Next[time] I will try to get a brighter poster and bigger pictures.</td>
</tr>
<tr>
<td>I can’t do anything immediately because the school year is over, but If I were to do it again, I would have catered more to the 5th graders.</td>
</tr>
<tr>
<td>[I]f I ever do something like business day again, I will give 5th graders surveys to find out if they like my product before I make it.</td>
</tr>
<tr>
<td>I will continue to do what I am right now because I did achieve my goal. For improving my work, I will look it over at least two times for errors</td>
</tr>
</tbody>
</table>

Students demonstrated several different strategies throughout the three project artifacts that helped them to self-regulate during the PBL unit. The most frequently used strategies were goal-setting and planning, organizing and transforming, environmental structuring, self-consequating and casual attributions. The second part of research question two provides more detail into how high and low achieving students self-regulate.
**Research question 2b results.** A microanalytic approach study was used in order to answer the research question, “How do high and low achieving students self-regulate in a SRL infused PBL environment?” The specific scores of the two higher achieving students are on Table 23, and Table 24 provides the scores of the two lower achieving students. In each achieving group, one male and one female were selected from the treatment group and pseudonym names were used to protect the students’ identity.

Table 31

*Data from the Two Higher Achieving Students*

<table>
<thead>
<tr>
<th></th>
<th>Neil Pre Score</th>
<th>Neil Post Score</th>
<th>Jessica Pre Score</th>
<th>Jessica Post Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th SOL Civics</td>
<td>7th SOL Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children’s S-E</td>
<td>96.7</td>
<td>97.1</td>
<td>73.5</td>
<td>94.5</td>
</tr>
<tr>
<td>SRL SELF</td>
<td>90.6</td>
<td>97.1</td>
<td>73.5</td>
<td>85.1</td>
</tr>
<tr>
<td>Project Artifact A</td>
<td>14.5</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Artifact B</td>
<td>10</td>
<td>9.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Artifact C</td>
<td>28.5</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Artifact D</td>
<td>19.5</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>95</td>
<td>95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 32

*Data from the Two Lower Achieving Students*

<table>
<thead>
<tr>
<th></th>
<th>Andre</th>
<th></th>
<th>Carey</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Score</td>
<td>Post Score</td>
<td>Pre Score</td>
<td>Post Score</td>
</tr>
<tr>
<td>7th SOL Civics</td>
<td>449</td>
<td>428</td>
<td>433</td>
<td>406</td>
</tr>
<tr>
<td>7th SOL Reading</td>
<td>49</td>
<td>85.5</td>
<td>73</td>
<td>71</td>
</tr>
<tr>
<td>Children’s S-E</td>
<td>48.8</td>
<td>75.8</td>
<td>56.3</td>
<td>64.2</td>
</tr>
<tr>
<td>SRL SELF</td>
<td>8</td>
<td>8.5</td>
<td>8.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Project Artifact A</td>
<td>10.5</td>
<td>11.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Artifact B</td>
<td>25.5</td>
<td>22.5</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Project Artifact C</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Artifact D</td>
<td>65</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Content Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project artifact A.** In an effort to understand the SRL processes used during the unit, the researcher analyzed the four students’ progress feedback forms and project artifact reflections. The progress feedback forms provided the specific actions that students took while working on Project Artifact A during a class period and the project artifact reflection provides an overview of how students self-regulated in a SRL infused PBL environment. Most of Carey’s data were missing.

In Table 33, the two high achieving students exhibited high self-efficacy toward the specific task, but Andre, a low achieving student, had a moderate certainty that he could accomplish his goal. Neil clearly defined his goal, self-monitored his work toward the goal and self-evaluated his progress on the goal. He attributed his accomplishment to his “steady work” and efforts and he was highly satisfied by his work. Jessica demonstrated a broad goal “don’t get distracted” to complete her task and she recognized
that it was poor in her self-evaluation. Despite creating a poor goal, she believed that her effort was good unlike Andre who gave himself a two out of a five for participation because he did not finish. Andre created a specific performance goal (“Answer Q 1 + Make a survey”) and monitored his work in general, but he attributed moderate satisfaction for the task because he believed the work still needed to be revised. A summary of the results of the microanalysis process can be found on Table 33.
**Table 33**

*Microanalytic Measures for Project Artifact A*

<table>
<thead>
<tr>
<th></th>
<th>Neil</th>
<th>Jessica</th>
<th>Andre</th>
<th>Carey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-E score</strong></td>
<td>85</td>
<td>80</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td><strong>Goal-setting</strong></td>
<td>Define my project idea. Create survey/website and Q. 1</td>
<td>“Don’t get distracted.”</td>
<td>Answer Q 1 + Make a survey</td>
<td>-</td>
</tr>
<tr>
<td><strong>Self-Monitoring</strong></td>
<td>I defined my project and started on the website</td>
<td>I have created a powerpoint.</td>
<td>I’m almost done with my survey.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Self-Evaluation</strong></td>
<td>5/5 – Almost accomplished my goal, I defined my project, but didn’t finish the survey/website</td>
<td>5/5 – No, I did not. I made my goal too broad.</td>
<td>2/5 – Yeah, but I did not finish.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Attributions</strong></td>
<td>I worked steadily the whole time</td>
<td>I focused and stayed on task. I also got a lot done</td>
<td>I did not finish both of my goals.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Self-Satisfaction</strong></td>
<td>85 – I did what the rubric asked, but could have elaborated more.</td>
<td>90 – I was very focused and knew what I had to do, but I reviewed it last night and made a lot of changes so I procrastinated a little bit.</td>
<td>60 – The PowerPoint wasn’t that neat and creative and eye catching. (I think it needs to be revised.)</td>
<td>90</td>
</tr>
</tbody>
</table>
According to the findings in Table 34, the students excluding Carey demonstrated self-regulatory learning processes in Project Artifact Reflection A, but at various levels. According to their project artifact reflection, they all achieved their goals; however, Jessica and Neil’s grades were 15-20 points higher than Andre and Carey’s. Jessica and Neil, higher achieving students, took an active role in all three phases of Zimmerman’s model and identified specific strategies that they utilized (agenda, self-monitoring, environment). Moreover, they linked the strategy they used to a specific action. For example, Jessica states she uses a self-monitoring sheet to “…Helped me realize what I still needed to do.” In contrast, Andre and Carey were more general in their explanations with strategies not explicitly in detail (“…finish a good part of my project”). For example, Carey wrote, “To give myself breaks and I had a schedule for myself” And Andre said, “…I did half of it per day.” Carey did not provide a specific plan to complete her project artifact.

Andre demonstrated a few SRL strategies, but did not seek help or review the rubric closely to complete his project. The microanalysis component of Project Artifact A supports the project artifact reflection because the high achieving students’ demonstrated high self-efficacy, used several SRL strategies and had a high satisfaction rating with their performance. Andre and Carey demonstrated some strategies, but did not connect them to their progress toward their goals on the project. Carey was highly satisfied with her project artifact despite later earning a low grade on it, but Andre was not because he realized that it still needed to be revised.
### Table 34

**SRL Processes used in Project Artifact Reflection A**

<table>
<thead>
<tr>
<th></th>
<th>Forethought</th>
<th>Performance</th>
<th>Self-Reflection</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neil</strong></td>
<td>I set a SMART goal to get everything done in a timely fashion.</td>
<td>I used the Rubrik (sic) to make sure that I had completed everything.</td>
<td>I asked for help well. I used the rubric/checklist well. I would change the treat to something less addictive.</td>
<td>I would continue to do the things that worked well from the above section, and change the others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Jessica</strong></td>
<td>Agenda – I made a checklist before I started so I knew what I needed to do.</td>
<td>Self-monitoring sheet—Helped me realize what I still needed to do. Environment – I made sure to only have my powerpoint open, and to close my email and google so there was less of a chance I would get of (sic) task…</td>
<td>Time – I think I managed my time well because I only had one tab open to stay focused, and doing my project in short chunks and not all at once helped me see what I needed to do…</td>
<td>Re-read things – Next time, I will re-read my project more so it makes sense. I will also re-read the directions so I know what I am doing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Andre</strong></td>
<td>This time I didn’t use a planner but I did half of it per day. I think I didn’t do that well on it such as the neatness and creativity part of it.</td>
<td>I went away from distractions and I said to myself that [I] can go to the internet if I finish a good part of my project.</td>
<td>Yes I did complete my goal because it finished it but it didn’t workout well. Next time, I would ask help with the neatness &amp; creativity.</td>
<td>I will ask help so the person could give me advice. I didn’t read the rubric that much.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Carey</strong></td>
<td>To give myself breaks and I had a schedule…</td>
<td>I stayed on my schedule and gave myself treats.</td>
<td>I did achieve my goal and my strategy did work.</td>
<td>I would use less music when I work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Project artifact B. As demonstrated in Table 35 the higher achieving students again explained in greater detail how they utilized SRL strategies to help them accomplish their goals.
Table 35

*Microanalytic Measures for Project Artifact B*

<table>
<thead>
<tr>
<th>S-E score</th>
<th>Neil</th>
<th>Jessica</th>
<th>Andre</th>
<th>Carey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80</td>
<td>100</td>
<td>80</td>
<td>-</td>
</tr>
</tbody>
</table>

**Goal-Setting**

- ...ask teacher to review P.P.
- Create and use a self-monitoring checklist and “Review my PowerPoint with 2 other people.”
- Answer Q. 2-
- Create powerpoint

**Self-Monitoring**

- I have reviewed the survey and am working on the PP
- I have created a self-monitoring checklist and filled it out.
- Yes because I finished answering Q #2

**Self-Evaluation**

- 5/5 – Yes, I reviewed the survey, worked on the PP, and reviewed it with [teacher’s name].
- 5/5 – I did. I made a checklist and did it and also edited my presentation.
- No grade given or comment

**Attributions**

- I worked steadily on topics related.
- I stayed on task and I accomplished (sic) ALL of my smart goals.
- No answer given

**Self-Satisfaction**

- 85 – The content was good, but more time could have been spent on the formatting.
- 80 – I worked hard to complete Artifact B, however I didn’t spend a lot of time re-checking my work.
- 40 – Because, I did the calculations but it looks empty because I forgot to do the graph.
- 85 – buy more products
Andre, Neil and Jessica demonstrated high self-efficacy scores, but differences existed again between Andre and the two high achieving students in self-satisfaction. One possible explanation could be that Neil and Jessica created a goal that incorporated at least one SRL strategy, but Andre focused on just completing the product. Neil and Jessica utilized self-monitoring and self-evaluation strategies connected to their goals and attributed their reason for success to the efforts to complete the task not their ability. They demonstrated high satisfaction, but Andre did not complete the self-evaluation and attributions during class and had low satisfaction with his performance.

Similar to the microanalysis questions, the higher achieving students based their Project Artifact Reflection B goals on the artifact by creating a budget (Table 36). For example, Neil “…premade a prototype to help with the expenses” and Jessica stated “brainstorming questions with Project Artifact Reflection B, helped me do a better job on the assignment.” In contrast, Carey created a goal that was focused on what she needs to make her business, which was not the focus of the project artifact. Carey stated, “…I still need to buy products.” In contrast, Andre stated he had high self-efficacy, utilized a strategic planner and self-instruction to help him focus on the task. However, he was not satisfied with his finished product. One possible reason for this disconnect between strategy use and performance could be his lack of self-evaluation and monitoring skills. For instance, the higher achieving students used explicit strategies in self-reflection phases (e.g. checked against the rubric and used a checklist) whereas the lower achieving students provided general comments, such as “I think I did well explaining all the topics”.

147
<table>
<thead>
<tr>
<th></th>
<th>Forethought</th>
<th>Performance</th>
<th>Self-Reflection</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neil</td>
<td>I mapped out my time, like do task one for the first 30 min, and so on. I premade a prototype to help with the expenses.</td>
<td>I used a reward system, complete task 1 get 10 mins. on another site. I moved away from the distractions of my little brother.</td>
<td>I compared it to the rubric to see how well I did. I used the self-monitoring sheet to reflect upon my work.</td>
<td>I think that it worked well, and I would use the rubric and self-monitoring checklists again.</td>
</tr>
<tr>
<td>Jessica</td>
<td>Calendar – I think I used a calendar well to put when different parts of the assignment were due. Brainstorming – I think brainstorming questions with Artifact B, helped me do the assignment better</td>
<td>Self-monitoring sheet – The sheet helped me see what I still had to do. Environment – I sat in a good place where I wouldn’t get distracted and could get my work done.</td>
<td>Time – I think I used my time very well and even had extra time at the end. Checklist – The checklist in my agenda helped me see what I had to do.</td>
<td>Rubric – Next time, I will look at the questions and the rubric on the Artifact B sheet to help guide me more on the project.</td>
</tr>
<tr>
<td>Andre</td>
<td>I thought that this part was going to be easy so I had high confidence. I used a strategic planner.</td>
<td>I said to myself, that if I figure out the prices and figured out the calculations I can watch one episode of an anime.</td>
<td>I achieved my goal but it didn’t turn out the way I wanted to. Next time I should seek help from others such as a teacher...</td>
<td>I will plan out what the finished product first &amp; Review the rubric.</td>
</tr>
<tr>
<td>Carey</td>
<td>I feel I covered all the topics but I still need to buy products</td>
<td>I think i did well explaining all the topics, but im (sic) missing cost, because I need to buy more.</td>
<td>I still need to printout my project. I covered all the topics and I still need to buy some products.</td>
<td>-buy a cotton candy machine and cotton candy mix -cones -poster board</td>
</tr>
</tbody>
</table>
Although Carey mentioned she moved away from distractions in the performance phase, her action plan states, she “…plan[s] to focus more on my work”. This may signal that Carey is aware that she needs to focus more on the project artifact then on the end product (her business). Andre also demonstrates maladaptive practice by stating for a second project reflection that he needs to seek help, but does not to only be dissatisfied on this project artifact again.

**Project artifact c.** In Project Artifact C, there were two progress feedback forms completed (PFF 3 and PFF 4). During this project artifact, students completed an advertisement of their choice and could demonstrate it in any capacity (e.g. website, video, poster, pamphlet, newspaper article). During this time, students were also preparing for Business Day where they would sell their business products to the 5th graders.

In Table 37, all four students demonstrated high self-efficacy toward how capable they would be achieving their goal(s). At this point in the project, all the students demonstrated performance oriented goals in the classroom focused on completing the project artifact and preparing for Business Day. In Tables 37 and 38, the students excluding Carey demonstrated self-monitoring and self-evaluation skills directed toward the goal they created. In addition, they all demonstrated a high satisfaction with their work because they met the requirements and finished. For the first time, Andre’s self-efficacy was close to his self-satisfaction on his project artifact. One possible reason could be that he exhibited improved time management by completing and editing his work and he was proud of his effort (“…looked good to me.”)
Table 37

Microanalytic Measures for Project Artifact C (First Time)

<table>
<thead>
<tr>
<th></th>
<th>Neil</th>
<th>Jessica</th>
<th>Andre</th>
<th>Carey</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-E score</td>
<td>85</td>
<td>90</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>Goal-Setting</td>
<td>Artifact C</td>
<td>Review Rough draft and Take pictures</td>
<td>Edit my rough draft</td>
<td>-</td>
</tr>
<tr>
<td>Self-Monitoring</td>
<td>I have perfected the layout and am adding propaganda.</td>
<td>If I have taken a lot of good quality pictures</td>
<td>I finished half of the rough draft.</td>
<td>-</td>
</tr>
<tr>
<td>Self-Evaluation</td>
<td>5/5 Mostley (sic), I completed all of the important parts.</td>
<td>5/5 - I did because I took a lot of good pictures and stayed on task.</td>
<td>4/5 – I finished all the things I needed to do.</td>
<td>-</td>
</tr>
<tr>
<td>Attributions</td>
<td>I worked diligently and efficiently.</td>
<td>I felt like I got a lot of good quality work done.</td>
<td>I finish my SMART goal.</td>
<td>-</td>
</tr>
<tr>
<td>Self-Satisfaction</td>
<td>85 - Because I did all that was required, but could have added more propaganda.</td>
<td>95 – I worked very hard on my poster but my text was a little small and could have been bigger.</td>
<td>70 – Because I did finish it and it looked good to me.</td>
<td>90 – I did everything …but I did less work some[e] days.</td>
</tr>
</tbody>
</table>
Table 38

*Microanalytic Measures for Project Artifact C (Second Time)*

<table>
<thead>
<tr>
<th></th>
<th>Neil</th>
<th>Jessica</th>
<th>Andre</th>
<th>Carey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal-Setting</strong></td>
<td>Review and check my final copy.</td>
<td>Peer Review and Plan what to say (write it up and practice at least once)</td>
<td>Edit what I’m going to say</td>
<td>-</td>
</tr>
<tr>
<td><strong>Self-Monitoring</strong></td>
<td>I have reviewed my work already.</td>
<td>I have done a peer revision.</td>
<td>Im almost done editing it.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Self-Evaluation</strong></td>
<td>5/5 Yes I have done just about everything.</td>
<td>5/5 – I did because I got good feedback and I made a speech.</td>
<td>5/5 – I finished everything I had to do.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Attributions</strong></td>
<td>I worked hard and completed much.</td>
<td>I got a lot of last minute planning done.</td>
<td>I finished everything I had to do.</td>
<td>-</td>
</tr>
</tbody>
</table>

Similar to previous project artifact reflection responses, Table 39 shows the higher achieving students used specific strategies (e.g. sketched out rough draft and strategic planner) compared to Carey who stated a general strategy of “I had breaks I did my poster a little at a time… I finished my poster and product on time”. Unlike the previous project artifacts, Andre exhibited a SRL strategy in the forethought phase that was linked in the performance and self-reflection phases. Andre stated, “…managing my time w/a list of things to do. These strategies made me meet my goal at the end.”
Table 39

*SRL processes used in Project Artifact Reflection C*

<table>
<thead>
<tr>
<th>Forethought</th>
<th>Performance</th>
<th>Self-Reflection</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neil</td>
<td>I removed myself from the distractions of other classmates.</td>
<td>I sought help from [teacher’s name] when I had a question about the procedures.</td>
<td>I will continue to do everything that I did before, but I will do a better job of removing myself from distractions next time.</td>
</tr>
<tr>
<td>Strategic Planner – The sheet helped me clearly see what I had to do and</td>
<td>Environment – I put my computer, phone and ipod away so I could completely focus…Treats-</td>
<td>Time – I could have timed myself better because I spent a lot more time on my project because of poor</td>
<td>Plan better…a million things I had not thought about went wrong and as a result, it took me longer than it should have</td>
</tr>
<tr>
<td>had to get to complete Artifact C.</td>
<td>After I finished each section …I let myself watch 10 mins of TV</td>
<td>time management.</td>
<td></td>
</tr>
<tr>
<td>The strategies that worked out well for me is to get away from</td>
<td>I moved away from distractions &amp; used a checklist/agenda to manage my time properly.</td>
<td>I did manage to complete my goal, I used my time properly but I think I still need to ask someone such as a friend to look over it so I can improve on it.</td>
<td>I will ask someone to revise it (or give tips) and make it look more creative.</td>
</tr>
<tr>
<td>distractions &amp; managing my time w/a list of things to do. These strategies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>made me meet my goal at the end.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carey</td>
<td>I finished my poster…on time by doing a little at a time</td>
<td>I finished my poster on time I finished my product on time</td>
<td>I will do the same strategy</td>
</tr>
</tbody>
</table>
In the Performance phase, Andre again referred to his checklist/agenda to manage his time and self-reflect by explaining how he used his time well. This is a significant change for Andre from Project Artifact A and B, which is shown in his self-satisfaction score of 70 compared to his previous scores of 40 and 50.

In the Self-reflection phase, Carey continued to focus on completing the poster and finishing on time instead of focusing on whether the strategy worked. Carey did achieve her goal of completing the poster, but lacked specific strategy use to ensure it was her best work. In contrast, the higher achieving students and Andre used motivational strategies (“pep talk” and move away from distractions) and specific self-consequating strategies (e.g. treats) to help them continue to work to do their best. They self-reflect on their specific strategy use (e.g. evaluated the project while using the rubric and needed to use their time better).

It is important to note that throughout the project, there were implementation checks by co-teachers, keeping lesson plans and a checklist. One part of the unit had an implementation fidelity issue. One of the treatment classes did not receive all the progress feedback forms in the study. This is one of the reasons why Carey had some data missing. The other reason was that Carey was absent and never made up the work, which was a problem during the unit. Although I used a checklist, some of the project artifact reflections and administering surveys did not allow much time to give students significant time to complete the progress feedback forms.

In summary, there were stark contrasts between the higher and lower achieving students in the way they utilized Zimmerman and Moylan’s three-phase model (2009).
The higher achieving students used specific strategies and focused on what they had to do on the project artifact. The lower achieving students stated more general strategies (e.g., “I finished my poster on time. I finished my product on time.”) and focused more on how they were going to make their products instead of the process of creating a business. The one anomaly to this is Andre’s consistent use of SRL throughout his Project Artifact C reflection, which resulted in his highest self-satisfaction and artifact grade.

**Summary of the Results**

In this section, the data demonstrated the treatment group had statistically significant differences from the comparison group in self-efficacy on the SELF test, but not on the Children’s Self-efficacy for Self-Regulated Learning (CSESRL) scale. The two groups were not statistically significantly different with respect to project artifact achievement and content knowledge test. Students in the treatment group scored higher on Project Artifacts A and B, but no major differences were found between the groups on Artifacts C and D. The results also demonstrated the most frequently used SRL strategies students used to self-regulate in a PBL environment; and how high achieving students utilized more SRL strategies than low achieving students. Based on the findings, limitations, educational implications for practice and future research, limitations and conclusions will be discussed in the next section.
CHAPTER FIVE

This quasi-experimental mixed method study was conducted to examine whether infusing self-regulation learning processes into a 7th grade PBL unit impacted student learning related to self-efficacy, project artifact achievement and content knowledge. Another aim was to understand how students self-regulate during a SRL infused project-based learning environment and how high, and low achieving students self-regulate. To examine these findings in more detail, the section below will explain what the results signify in relation to the questions posed at the beginning. The results will also be analyzed to understand if they connect to either question or extend the current literature on this topic. The chapter will conclude with implications for design and practice, limitations of current research and recommendations for future research.

Research Question One

Research question one: Are there differences between the treatment and the comparison groups in students’ self-efficacy beliefs for self-regulated learning, self-efficacy for learning form (SELF), project artifact achievement and content knowledge?

This question was addressed by analyzing each measure. One of the purposes of this question was to examine whether self-efficacy beliefs changed during the course of the unit for either group. This is a critical question because self-efficacy for learning plays an important role in being a self-regulated learner (Schunk & Usher, 2011) and influences the amount of effort, response to feedback, persistence and strategies used
toward completing a task (Bandura, 1997; Bandura, 2004; Locke & Latham, 1990; Pajares, 2003, 2005, 2008; Zimmerman, 2002). Both the treatment and comparison groups demonstrated high self-efficacy toward self-regulated learning even before the project with composite scores for treatment Pre $M = 79.26, SD = 11.45$; Post $M = 82.56, SD = 8.62$ and comparison Pre $M = 77.16; SD = 12.51$; Post $M = 78.84, SD = 11.8$. Both group scores increased, with the treatment group increasing two points more. However, the results after conducting a one way ANCOVA are not statistically significant. These results are similar to Gerlach’s dissertation (2008) where Bandura’s Self-Efficacy scale showed no significant difference between the pretest and posttest. Her student self-efficacy scores were considerably lower (pre-test of 52.70 and post-test of 51.88) than those found in this study. One of her explanations for the lack of differences was that only six of the eleven items were related to project-based learning activities and students may not have been familiar with the information on some of the items. Usher and Pajares (2008) support this explanation by stating efficacy beliefs are optimally predictive when used for the specific task being assessed. This may also be the situation in this study. These results were different from the Self-efficacy learning form (SELF).

Similar to Self-efficacy for Self-Regulated Learning measure, the pre-test SELF scores were high for the treatment group $M = 72.35, SD = 12.32$ and comparison group $M = 71.93, SD = 14.62$ with both groups showing improvement. After conducting a one-way ANCOVA, the treatment group’s score increased more $M = 80.91, SD = 9.8$ compared to the comparison group $M = 76.34, SD = 10.0$ and it was found to have statistically significant differences with a Cohen d effect size of .46 (Cohen, 1988).
These results support the current research from other interventions that utilized Zimmerman’s SRL model. For example, Schmitz and Wiese (2006) found the experimental group had higher improvement scores than the control group in self-efficacy. Moreover, Stoeger and Ziegler (2008) showed that self-efficacy was also a statistically significant indicator for the treatment group. These findings further support a previous high school study where students who were taught SRL skills through monitoring and imitation were more likely to have higher levels of academic self-efficacy compared to students who did not receive any (Labuhn, Zimmerman, & Hasselhorn, 2010).

When examining project artifact achievement and content knowledge, research supports that students’ use of SRL fosters a direct effect on their academic achievement and skill development (Boekaerts & Corno, 2005; Schunk, 1990; Schunk & Zimmerman, 1997; Turner & Patrick, 2004; Winne, 2005; Zimmerman, 2002; Zimmerman & Martinez-Pons, 1988). Despite this research, there were no significant differences found between the groups for either the project artifact achievement or content knowledge test. This does not support the research found in the Schmitz and Wiese (2006) when the experimental group showed an improvement in percentage of the learned material. One possible reason for the lack of differences in project artifact achievement is that the unit was completed at the end of the year. Although students learned SRL strategies and applied them during the unit, students’ assessment of their performance could be focused on assessment criteria and their performance level goal they learned earlier in the year (Panadero & Alonso-Tapia, 2014). Assessment criteria refers to having students
accurately assess their work based on a concrete evaluation tool (e.g. rubric) and they can make corrections. However, the performance level goal can play a significant role in student outcomes because it is what they base their self-evaluation on and are influenced by the assessment criteria. For example, two different students could apply the similar SRL strategies, but have different goals at the beginning of the task which could impact the outcome. One student’s goal is to earn an A and the other is to earn a C, which would both make them happy. The goal created in the Forethought phase directly influences the standards in which they assess their work and determine their success or failure. Therefore, students’ performance level goals could have been established before the unit, making achievement differences between the groups minimal. A possible reason for the lack of difference in content knowledge could be contributed to the assessment being only 20 multiple-choice questions. Students should have to demonstrate their knowledge on the unit applying what they learned to a new situation not just answering multiple-choice questions. The last reason is that the sample size was very small (N = 52). In future research, it is recommended to conduct a study for a semester or even a year to determine if there are achievement differences on project artifacts and content knowledge.

**Research Question 2a**

Research Question 2a: How do middle school students apply SR processes in a SRL infused PBL environment?

Students demonstrated many different types of self-regulatory strategies throughout the creation and implementation of their business project. Students most
frequently used goal-setting and planning and organizational strategies (e.g. outlining, lists) during the Forethought phase. As the microanalytic approach study demonstrated, all goals are not created equally (Schunk, 2001a). Goals must be linked to a performance standard and must not be too easy, but not impossible. While all the treatment group students received the same instruction in goal setting, there were differences in how they created their goals and planned. This is important because the teacher’s role to help students in setting goals is to help them focus by providing feedback on using a specific strategy, time management or working toward a larger or more challenging goal. Collaboration with a peer or in small groups could help students who need additional assistance, but the focus of the discussion must be on individual efforts not on social comparison which impacts students who believe they are not as capable (Bandura, 1997). As students gain proficiency and see goals helping to direct their learning, research shows transition to performance goals has improved achieving their goals (Zimmerman & Kitsantas, 1999).

In the Performance phase, students exhibited environmental structuring and self-consequating (treats) most frequently with approximately 29 – 62% of students self-reporting using these strategies during the artifact reflections. Students discussed how they moved away from distractions, such as siblings, technological devices and friends. To reward themselves, they used technology, food and friends to help them have self-control. These findings are not that surprising since students explained while learning about the different SRL strategies that some had experiences using these strategies previously during academic, music or sports performance. This supports the research that
the main way to increase one’s self-efficacy is by personally involved accomplishments (Schunk, 1981; Schunk & Schwartz, 1993; Zimmerman & Kitsantas, 1996). More importantly, when teachers are teaching SRL to students, they should ask students if and how they used these strategies and then the teacher should help them see how they can use similar strategies for classroom performance. Research supports the importance of discussing how, when and why SRL is necessary for students to learn and receive specific SRL strategy instruction (Paris & Winograd, 1999).

In the Self-reflection phase, students exhibited casual attribution strategy most frequently with approximately 50% of them using it in the project artifacts. Most of the attributions were positive signaling they believed they could achieve at higher levels through effort and motivation. It is important to note that a student’s casual attribution is impacted by previous experiences, classroom climate and what goals are established (Ames & Archer, 1988). Therefore, teachers could play a significant role in how students attribute their success or failure. In addition, SRL instruction that focuses on mastery or process learning, skill building and self-reflection could have a positive impact on a student’s view of their efforts.

**Research Question 2b**

Research Question 2b: How do high and low achieving students self-regulate in a SRL infused PBL environment?

While the four students in the case study applied SRL strategies in their artifacts to complete the project, the high and low achieving students demonstrated significant differences in SRL use. These findings support Zimmerman’s (1998) notion that “all
learners try to self-regulate their academic learning and performance in some way, but there are dramatic differences in methods and self-beliefs among students” (p. 6). The first major difference was the two high achieving students had high self-efficacy (both in the 90’s out of 100) and demonstrated significant SRL strategies compared to the low achieving students self-efficacy scores (both in 60’s and 70’s). The high self-efficacy supports the findings that a strong correlation exists between high self-efficacy and self-regulatory learning strategies, goal setting and performance (Locke & Latham, 1990; Zimmerman & Martinez-Pons, 1992).

Another difference between the students was their goal orientation toward the tasks. While both groups set goals and demonstrated planning in the Forethought phase, the methods they used to achieve their goals were not the same. The two high achieving students utilized the mastery learning or process goal orientation by focusing on utilizing specific self-regulatory planning processes (e.g. agenda, creating a prototype, calendar, brainstorming, strategic planner and SMART goals). In comparison, the two lower achieving students created goals or plans to complete the task (e.g. finish Artifact A, finish Artifact B, cover all topics) and general statements (e.g. do my poster a little at a time). This study supports the research that students must first acquire the necessary SRL processes to complete the task before they can focus on the outcome (Zimmerman & Kitsantas, 1999). The low achieving students focused on the outcome, but utilized poorly adaptive practices that hampered their progress. Furthermore, the average project artifact scores between the high and low achieving students were approximately 15 to 20 percentage points different from each other. As mentioned, both groups established
goals, but that does not automatically mean better performance or increased self-regulation. Research supports the notion that goals cannot be broad like those found with the low achieving students, but must be linked to a performance standard and must not be too easy, but not impossible (Schunk, 2001a). The high achieving students connected their goals to the performance by creating a checklist, a prototype, and a strategic planner that helped them decide what still needed to be done.

Similarly to the Forethought phase, there were differences in the Performance and Self-reflection phases between the groups, with most notably a lack of metacognitive monitoring skills by the lower achieving students. Zimmerman (2002) explains that expert SRL students are adaptable, and utilize and change their learning strategies in diverse learning situations and tasks compared to novice learners. In the Project Artifact Reflection A, B and C during the performance phase, the two high achieving students utilized fourteen strategies in total and six different strategy types. In contrast, the two low achieving students used seven strategies and four different strategy types, using more general descriptions, which was supported by previous research (DiBenedetto & Zimmerman, 2010).

In the Self-reflection phase, the low achieving students stated what they did (achieved goal), but did not self-evaluate their work against a criteria (e.g., rubric) or explain what they would keep or change. In contrast, the high achieving students judged their work and provided reasons for it with some being things they did well and some being areas for improvement.

The last difference demonstrated in the action plan phase was to see how students
were going to use what they learned from the project artifact to inform their work. Similar to the Self-reflection phase, the low achieving students showed little reflection on what they did well or needed to improve, with most of their responses being to do the same strategy. When they did mention a strategy, it was an external environment (use less music, still move away from distractions). These comments may indicate that the students were satisfied with their artifact completion and met their outcome expectancy or goal (Panadero & Alonso-Tapia, 2014).

There were contrasts between the higher and lower achieving students in the way they utilized Zimmerman and Moylan’s three-phase model, self-efficacy and project artifact achievement which is similar to previous research (Cleary & Zimmerman, 2001; DiBenedetto & Zimmerman, 2010). The higher achieving students used specific strategies and focused on the process of completing the project artifact. The lower achieving students stated more general strategies (e.g. “I finished my poster on time. I finished my product on time”) and focused more on how they were going to make the business products to sell, instead of the process of creating a business.

**Andre.** Although there were some clear differences in how higher and lower achieving students self-regulate in a SRL environment, Andre was a student who demonstrated tremendous growth as a lower achieving student. The benefits of the SRL intervention will be explored in this section.

Before the intervention, Andre lacked strategies to plan, organize schoolwork and limit distractions as demonstrated with the low self-efficacy scores in Table 40. This is not surprising mainly because Zimmerman (2002) states that there is rarely any
instruction on SRL skills and many students do not learn these on their own.

Furthermore, previous research supports that lower achieving students use fewer SRL strategies than higher achieving students (DiBenedetto & Zimmerman, 2010; Kitsantas & Zimmerman, 1999).

Table 40

Andre’s scores from selected questions on the Children’s Self-efficacy for SRL Scale

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan my schoolwork for the day</td>
<td>30</td>
<td>95</td>
</tr>
<tr>
<td>Organize my schoolwork</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Arrange a place to study without</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>distractions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Even after the intervention, Andre did not employ a goal-setting or planning strategy to support his learning. For example, Andre stated in Artifact Reflection A, “This time I didn’t use a planner but I did half of it per day. I think I didn’t do that well on it such as the neatness and creativity part of it.” Previous research supports that students must experience SRL through practice to realize the value it can have for other learning opportunities (Zimmerman et al., 1996). However, to his credit Andre did “chunk” the material into smaller parts to complete.

Andre benefited from the intervention because he had multiple opportunities to submit work. Moreover, he received feedback from the teacher and himself throughout the project by way of progress feedback forms and his own personal artifact reflections,
which have shown to be key to SRL intervention programs (Cleary & Zimmerman, 2004). He demonstrated a greater ability to create more specific and measurable goals through several opportunities during the unit. For instance, he did not create a planner in Artifact A but by the Artifact C reflection he created a list of things to do and stated specific strategies to make sure he completed the list (e.g. move away from distractions and manage my time) in Artifact C. In Table 40, his scores after the unit were all in the “highly certain can do” areas. Andre became more confident in his ability to do his best work by the end of the artifacts. His self-satisfaction scores included Artifact A 60, Artifact B 40 and Artifact C 70 and the higher grade obtained on Artifact C. Andre enhanced his perception of personal efficacy through the mastery experiences of setting and accomplishing a goal and having the project turn out the way he wanted it to.

Research has demonstrated that these experiences increase one’s self-efficacy (Schunk, 1981; Schunk & Schwartz, 1993; Zimmerman & Kitsantas, 1996). In summary, Andre’s goal-setting experience helped to increase his self-efficacy because he was able to experience the cyclical effect of how setting appropriate goals improved his commitment to finishing the task which also influenced his performance with the highest grade on Artifact C and increased his self-efficacy perceptions (Zimmerman & Cleary, 2006).

Similar to planning and organizing a task before the intervention, Andre did not believe he was capable of following through on a task, maintaining his concentration and improving academically as shown on the low scores on the SELF questions on Table 41. These challenges were also demonstrated in Project Artifact reflections A and B when he
was not happy with the outcome of his projects stating, “…it didn’t work out well” and “…but it didn’t turn out the way wanted to.”

Table 41

Andre’s scores from selected questions on the SELF Scale

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. When a lecture is especially boring, can you motivate yourself to keep good notes?</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>3. When you had trouble understanding your instructor’s lecture, can you clarify the confusion before the next class meeting by comparing notes with a classmate?</td>
<td>5</td>
<td>85</td>
</tr>
<tr>
<td>5. When another student asks to study together for a course in which you are experiencing difficulty, can you be an effective study partner?</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>7. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work?</td>
<td>20</td>
<td>85</td>
</tr>
<tr>
<td>9. When you have to take a test in a school subject you dislike, can you find a way to motivate yourself to earn a good grade?</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>10. When your last test results were poor, can you figure out potential questions before the next test that will improve your score greatly?</td>
<td>50</td>
<td>80</td>
</tr>
</tbody>
</table>

In Artifacts A and B, Andre established goals and provided a few strategies, but was not receiving the outcome that he desired. For example, he created specific
performance goals for both artifacts “Answer Q 1 + Make a survey” and “Answer Q. 2 – Create PowerPoint”, but did not monitor his work. He only focused on completing the task and rewarding himself for finishing the task by either going onto the Internet or anime. In the Self-reflection phase, he mentioned that he met his goal, but it did not work out the way he wanted it to. One possible reason could be he was not self-monitoring his progress during the task and not self-evaluating his work. For instance, he stated in the Artifact reflection A action plan that he “…didn’t read the rubric that much.” Andre also demonstrates maladaptive practice by stating for a second straight project reflection that he needs to seek help, but does not, only to be dissatisfied with this project artifact again.

Despite Andre’s frustration, Andre benefited from the SRL intervention because he was able to identify what he was doing well and what he needed to change. This self-awareness made a significant impact on Andre’s Artifact C. For the first time, Andre’s self-efficacy was close to his self-satisfaction on his project artifact. One possible reason could be that he exhibited improved time management by completing and editing his work and he was proud of his effort (“…looked good to me.”) Unlike the previous project artifacts, Andre exhibited a SRL strategy in the forethought phase that was linked in the performance and self-reflection phases. Andre stated, “…managing my time w/a list of things to do. These strategies made me meet my goal at the end.” This is an example of how Andre with the help of the SRL intervention became more strategic in his planning, monitoring and evaluating. Research shows that students who have more experience in using specific strategies during learning demonstrate higher levels of success and adaptive motivational practices (Cleary, Platten, & Nelson, 2008).
In the Performance phase, Andre again referred to his checklist/agenda to manage his time and self-reflected by explaining how he used his time well. This is a change for Andre because he had his highest self-satisfaction score of 70 in Artifact C compared to his previous scores of 60 on Artifact A and 40 on Artifact B. He self-reflected on his specific strategy use by stating he did achieve his goal and used his time properly (e.g. used a checklist/agenda). Andre used his previous reflections to make explicit changes to his approach to Artifact C and his change was in the Performance phase by self-monitoring his progress by using a checklist. The intervention provided Andre a way to become more actively involved in his learning process by having him reflect and act upon each major phase of the Zimmerman’s SRL model. Through much practice, Andre demonstrated higher achievement with an Artifact C score of 80, significantly higher self-efficacy pre-to-post scores on both scales and an improved self-satisfaction with his work. Andre is one example of how explicitly teaching self-regulation learning has a direct impact on academic achievement (Paris & Paris, 2001).

Role as Researcher in the Study

I had the unique opportunity to be the researcher and teacher in the study. This section will discuss my dual role to provide a transparent understanding of the process I took simultaneously.

My role as the teacher. I had piloted the business project twice and SRL interventions in previous years and made significant changes to the structure and curriculum based on student feedback, further research and personal reflection. The challenge that I faced every year was that the business curriculum was at the end of the
year and it was close to the two week state testing. PBL experience teachers suggest to always build in additional instructional time. While I did build in an additional week, we also started a new personal finance program before the business project which did not allow for any more time to complete the project. In addition, the end of the year with field trips, finals and end of the year activities left no time to extend the project beyond the dates planned in the winter of that year.

The challenge of also completing this project as the classroom teacher was knowing that I had to follow the same exact lesson plans and time for each class. Since the classes were mixed ability with no honors or remediation classes available, some classes are able to complete tasks more quickly than others. The only time that students did not receive the same amount of time on the tasks was when the treatment group completed the reflections or forms and the comparison group had more class time to work on the project.

As the teacher, I also removed giving prompts and supports to students about completing the project artifact reflections and progress feedback forms. If I did not complete the research study, I would have given prompts to ask clarifying questions or have them expand on some of their answers. I did provide feedback on the progress feedback form where teacher feedback was requested.

**Role of the researcher.** The dual role of teacher and researcher was challenging especially because there were many parts to the study. I had all the forms copied before the study and at least a week in advance I had the labels on the papers in advance except for once. I had the envelopes labeled and when completed I put the paperwork in the
folder and made a copy. I put both copies of all the documents in the school safe and did not touch them until the year was completed. Since the study was in four of my six classes (five civics classes and one enrichment class), I used a simple checklist to indicate that the envelope was in the secure location. Despite this organization strategy, I had these forms on top of the paperwork I had for teaching and my other responsibilities including being department chair. In my previous pilot studies, I only used two classes and added the microanalytic approach for my dissertation so the paperwork was more than I was used to even when I piloted it.

**Limitations**

There are some limitations to consider when reviewing the study. These limitations include sample of participants, duration of the study, self-report measures and researcher’s biases.

The first limitation is the study was conducted by one teacher in one school with a small sample of 52 participants in four classes. The results would not be possible to generalize, but could add to the literature about using SRL in a PBL classroom. Moreover, the participants in the study do not necessarily represent a diverse and typical American classroom. The school population is predominantly Caucasian and represents a middle class community. Moreover, the study excluded students who received Special Education services because it was beyond the scope of the goals of this study. Moreover, a larger size sample size would have provided more data and strengthen the power analysis.

The second limitation is the length of the study. The entire study was eleven
instructional weeks. During this study, students took three state tests abbreviating certain class periods from a block schedule of 90 minutes to 45 minutes every other day. Moreover, four of those weeks were devoted to teaching and having students practice Zimmerman’s SRL model while still learning the curriculum. A study that included multiple PBL units would help to explain in greater detail the differences and similarities found in the qualitative results that would show students self-regulated throughout a longer period than a unit.

A third limitation is self-report surveys because students could have not taken the survey seriously or rated themselves the way the researcher thinks they should answer. To mitigate this potential problem, the researcher spoke to the students about the importance of taking the surveys seriously and to be honest in their ratings. Moreover, students did not write their name on the sheet (identification number was on the sheet) and the students knew that the surveys would not be reviewed until after the school year was completed.

The fourth limitation is that students did not complete a project artifact reflection for Artifact D, and they only had one class period and had one night to complete the assignment. Since Artifact D was answering the driving question, students completed the reflection assignment in one class and that is why they did not complete an artifact reflection. This could be one reason why the treatment and comparison groups had similar scores because students did not utilize self-regulatory learning strategies. In addition, the comparison grouping had a slightly higher overall grade.

The fifth limitation is that the content knowledge test was only 20 multiple-choice
questions. The year after the study, the school district bought an improved assessment test bank and in the future a better measure must be created to have students demonstrate their applied and transferable knowledge from the unit.

The last major limitation is the dual role as the researcher and teacher of the study. The researcher was cognizant of the intricate nature of this dual role and ensured many fidelity checks throughout the project (e.g., another teacher administering the surveys, parallel lesson plans for each class, student scores confidential until after school year ended. Despite these checks, a few concerns could be raised. The differences in the study could be contributed to the Hawthorne effect, which means the behavioral and performance changes could be in response to a new or increased attention. However, research demonstrates this is probably not the case because the comparison group (no SRL instruction) knew they were part of the study (Stoeger & Zigler, 2008). The researcher also kept a detailed unit plan that was used to ensure that all students received the same instruction.

**Educational Implications**

This study focused on whether teaching self-regulatory learning intervention impacted self-efficacy, project artifact achievement and content knowledge achievement in a project-based learning environment. The study also examined how students self-regulate during a SRL infused PBL environment and how high and low achieving students self-regulate. Based on the findings in the study, there are some practical implications to consider.

One major implication is that project-based learning (PBL) provides a different
kind of instructional approach to help address the problems associated with the “tell test” and teacher directed approaches that are common in schools (Pianta, Belsky, Houts, & Morrison, 2007; Prensky, 2001). These approaches have had devastating impacts on motivation (Bridgeland, Dululio, & Morrison, 2006) and preparing students for the world (Alliance for Excellent Education, 2007). One way to successfully make this change is to provide a student-centered inquiry-based approach and teach students explicit strategies to set goals, and strategies to help them work toward completing a challenging task. The self-regulatory processes, such as goal setting, self-monitoring, and self-evaluation, can be learned from explicit instruction and modeling by teachers and peers (Zimmerman, 2002). The intervention demonstrated a statistically significant difference in the SELF, a self-efficacy measure for students who were in the treatment group compared to the students in the comparison. In addition, the microanalytic approach participants demonstrated significant gains in student project artifact grades and self-efficacy for a student like Andre and helped high achieving students like Neil and Jessica during this challenging unit. These implications can have an impact beyond academic success because self-regulation skills (e.g. time management, setting goals, effort and persistence) are important for professionals in their careers (Zimmerman, 1998).

The second implication is that how project-based learning is currently discussed in the field of education mitigates or neglects the student management component. (Larmer & Mergendoller, 2010; Markham, Larmer, & Ravitz, 2003; Thomas, 2000). For example, the student management component of PBL is often overlooked with only a few pages or a mention of different ways teachers can help structure the learning
environment. In Larmer and Mergendoller’s article on the ‘7 Essentials for PBL’ (2010) from the Buck Institute for Education (BIE), they did not directly mention self-directed actions or student management as shown in Table 34. Moreover, the George Lucas Educational Foundation created a website called Edutopia (2011). Edutopia’s mission is to improve K-12 education through innovative, practical and research practices to prepare students in the classroom and their careers. In 2011, they created 10 topics to include for PBL workshops, but again did not include student management, even though a review of literature demonstrates numerous challenges for students (Blumenfeld et al., 1991; Meyer, Turner, & Spencer, 1997). This study demonstrated a way for teachers to support student learning during a PBL unit by teaching them Zimmerman and Moylan’s SRL Model (2009) and how to apply self-regulatory learning strategies. In particular, the microanalytic approach demonstrated ways that students applied the strategies learned to set and achieve goals, monitor their progress and improve their subsequent performance by completing reflections.

To help facilitate student empowerment and self-regulatory skills in a PBL environment, professional development is key. A workshop for educators can help teachers learn about SRL and how to infuse SRL processes in a PBL classroom to support student autonomy, competence, and self-efficacy. Similar to the current study’s intervention, the professional development should incorporate a modeling section, a coaching section and a practice or application section.
Table 42

*PBL Professional Development Essentials and Workshop Topics*

<table>
<thead>
<tr>
<th>Seven essentials for PBL (Larmer &amp; Mergendoller, 2010)</th>
<th>Edutopia’s PBL workshop topics (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A Need to Know</td>
<td>1. Prepare Participants for Critical Viewing of Case Study Videos</td>
</tr>
<tr>
<td>2. A Driving Question</td>
<td>2. Watch Case Study Videos</td>
</tr>
<tr>
<td>3. Student Voice and Choice</td>
<td>3. PBL Experts</td>
</tr>
<tr>
<td>5. Inquiry and Innovation</td>
<td>5. Sylvia Chard’s Project Approach</td>
</tr>
<tr>
<td>6. Feedback and Revisions</td>
<td>6. Identifying and Asking Good Questions</td>
</tr>
<tr>
<td>7. A Publicly Presented Project</td>
<td>7. Examples of Online Collaboration in Projects Among the Schools</td>
</tr>
<tr>
<td></td>
<td>8. More examples of PBL Across the Country</td>
</tr>
<tr>
<td></td>
<td>9. Effective Rubrics for PBL</td>
</tr>
<tr>
<td></td>
<td>10. PBL Template: Develop a Project</td>
</tr>
</tbody>
</table>

This study demonstrated one practical way to help teachers prepare students to be self-regulated learners by using the five-phase Project-Based Inquiry Approach to Learning (Spires, Hervey, Morris, & Stelpflug, 2012). The five phases are: asking a compelling question or in this case exploring the driving question, gathering and analyzing information, creating and synthesizing information, evaluating and revising,
and publishing, sharing and acting (presenting). This model parallels with the SRL intervention cycle (Zimmerman et al., 1996) as demonstrated on Table 43.

Table 43

*Structuring Professional Development Opportunity*

<table>
<thead>
<tr>
<th>PBL inquiry approach (Spires et al., 2012)</th>
<th>SRL intervention (Zimmerman et al., 1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Compelling question or explore ways to approach the driving question – “Need to Know list”</td>
<td>1. Self-evaluate and monitor what knowledge and skills a student needs to know to investigate this question or problem posed</td>
</tr>
<tr>
<td>2. Gathering and analyzing information toward the driving question or posed questions</td>
<td>2. Forethought – creating plans and goals</td>
</tr>
<tr>
<td>3. Students create and synthesize information</td>
<td>3. Performance - Students implement their strategies and monitor their progress</td>
</tr>
<tr>
<td>4. Students evaluate and revise their work</td>
<td>4. Self-Reflection - Students linking their learning outcome to the strategic processes they used in the performance phase to either keep, change or adapt their strategies. Students may self-evaluate work based on an external measure (e.g. rubric)</td>
</tr>
<tr>
<td>5. Publish, share and act (present).</td>
<td>5. Depending on the project, this step could include the third or fourth SRL intervention cycle.</td>
</tr>
</tbody>
</table>

Similar to the students, the teachers need to not only learn about SRL and PBL, but practice how they would apply it in their classroom and infuse SRL into their PBL lesson.
plans. Moreover, follow-up support and continuing discussions and revisions are key in order to improve projects for student success. Lastly, school support and reorganization of structures (e.g. time, collaboration among colleagues) are crucial (Ravitz, 2008).

Another possible professional development idea is to support teachers in lesson study. Lesson study is a collaborative teacher led professional development process that builds knowledge and improves teaching by planning, observing, analyzing and reflecting on class lessons. Its origins come from Japanese elementary schools’ (Cerbin & Koop, 2006). The main goal of lesson study is to know how students learn from the lesson, by researching and studying how students make sense of the material and answer questions (Cerbin & Koop, 2006). Lesson study would encourage a group of teachers to plan, observe a specific PBL lesson and then reconvene to discuss ways to improve the process and outcome and seek additional support if needed.

A third implication is that the study demonstrates how students utilized various self-regulatory learning processes to complete a PBL unit. This can help educators to understand some of the most commonly used strategies (e.g. goal setting and planning, organizational strategies, environmental structuring, self-consequating and casual attributions) when students are completing challenging tasks. In addition, since there has been no SRL intervention that has been used to support students in a PBL unit, this study can provide one way to teach SRL to students so they can infuse SRL processes when completing a PBL unit.

The last implication is that low achieving students who exhibit limited self-regulatory skills may need additional support and guidance completing a project-based
learning unit. Teachers should identify students who may need additional support and provide significant support in goal creation, metacognitive monitoring, and self-evaluation. To also assist students who may need additional support, there should be more direct instruction during the unit, designing shorter projects with fewer, more specific standards (Markham, Lamer, & Ravitz, 2003).

**Future Research**

Future research would help to extend the findings in the study and enhance validity. Future research should include a more diverse classroom setting and larger sample size to see if differences exist between different groups of students racially, geographically and in socioeconomic status. This study consisted of mostly Caucasian participants from a high achieving middle class school.

Another area for future research is in self-efficacy measurements tailored to PBL activities. As noted by Gerlach (2008), the Bandura Self-efficacy for Self-Regulated Learning scale contains 10 items, but only six relate directly to project-based learning activities (e.g. “Get myself to do school work”, “Plan my schoolwork for the day”). In the future, self-efficacy for self-regulated items that complement a project-based learning context would provide further insight into how self-efficacy can play a role in a PBL setting. Research has shown that self-efficacy for self-regulated learning is optimized when measured to a specific task (Usher & Pajares, 2008).

Another example of future research is to create an assessment that measures content knowledge from a project-based learning activity. In the study, a 20 question multiple choice pretest and posttest was used to measure content knowledge on the
material learned from the unit; however, research demonstrates students who use project-based learning activities and self-regulation learning strategies have higher achievement, acquire problem solving skills and student motivation (Barron et al., 1998). A measure needs to be created to capture the content knowledge for student understanding and knowledge because a multiple choice test does not require deep conceptual knowledge or problem solving skills compared to a document based question (DBQ), or problem solving task. The last suggestion for future research is to conduct a longer study with multiple PBL units or a semester to examine how students apply the self-regulatory learning strategies to other project-based learning activities. This study would help to see how students apply skills and content from one unit to another.

**Conclusion**

The need for reform in K-12 classrooms has never been more paramount for an ever changing world. Employers need employees with the skills (problem solving, communication, critical thinking) to compete on the global market. Project-based learning (PBL) demonstrates a promising approach to combat the challenges schools face in preparing students for the future by creating a student-centered approach focused on real-world application of knowledge and skills, but it presents many challenges for students. There are three major conclusions from the study that support the need to infuse SRL strategies in a PBL environment.

The first major conclusion from the study is that the intervention demonstrates a practical way for teachers to infuse SRL processes into a PBL unit to improve self-efficacy. Using Zimmerman and Moylan’s (2009) feedback loop, teachers can
incorporate any PBL unit because SRL focuses on procedural knowledge (e.g. learning the steps in the SRL cyclical model) and conditional knowledge (e.g. using the SRL procedure or strategy during a task) so they can be infused into any curriculum or content (Zimmerman et al., 1996).

A second conclusion is that students similar to Andre in the microanalytic approach who had low self-efficacy and low project achievement scores could greatly benefit from a specific SRL intervention from Zimmerman and Moylan’s social-cognitive perspective (2009). Andre’s project artifact scores greatly increased from project artifact A to C. The difference could be seen in his ability to incorporate SRL strategies from general to more specific. This is important especially for students who lack self-regulatory skills because Zimmerman (2002) explains that many students fail to learn self-regulation learning strategies on their own.

Although future research is needed to extend the findings in the study and enhance validity, the last conclusion is that the study adds to the current literature on how infusing SRL in a project-based learning curriculum could impact achievement and motivation. Research has shown that middle school students who proficiently learn the cycle of self-regulation, retain knowledge and use of their skills at least two years after training (Zimmerman, 2002). The study demonstrated students who were in the treatment group had a statistically significant increase in self-efficacy and utilized several SRL strategies, which can help support students in a PBL environment and prepare them for an ever changing global market.
The call for reform in education has lasted decades because antiquated practices focused on testing discrete facts and concepts in a high-stakes testing environment. A balance of high stakes testing and a focus on inquiry-based practices are needed to prepare students for the changing skill and knowledge that are found in the 21st century knowledge economy. In 2014-2015 school year, Virginia has heeded this suggestion after students, parents, and educators urged lawmakers to reduce the number of state tests. The law, on Standards of Learning (SOLs) assessments has reduced the number of state tests from 22 to 17 with calls for reducing more in the future (HB 930). Before signing the bill into law, Governor Terry McAuliffe stated, “We’d rather see some critical reasoning and cognitive thought process going on because that’s how we know that you’re learning what you need for 21st century jobs” (Nadler, 2014, p. 1). Similarly, Texas reduced the number of state tests from fifteen to five in 2013 (Strauss, 2013).

The shift from multiple-choice test to real-world application, skills, and knowledge assessments are slowly changing throughout the country. Infusing self-regulatory processes into project-based learning environment can provide the support students need to tackle challenging tasks, but a systematic professional development program is needed. Educational leaders need to create three to five year goals to transition from a focus on state testing to assessments focused on solving problems by vertically articulating skills and knowledge applied from multiple subjects throughout a child’s K-12 education. As the knowledge economy continues to evolve so must the educational system to prepare our children’s future. Infusing self-regulatory learning processes into project-based learning provides a research supported platform to not only
teach real-world skills and knowledge, but also to motivate and provide life skills for students.
APPENDIX A

CHILDREN’S SELF-EFFICACY SCALE (BANDURA, 2006)

Directions: This questionnaire is designed to help us get a better understanding of the kinds of things that are difficult for students. Please rate how certain you are that you can do each of the things described below by writing the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0 10 20 30 40 50 60 70 80 90 100

Cannot do at all Moderately can do Highly certain can do

Self-Efficacy for Self-Regulated Learning

Finish my homework assignments for deadlines

Get myself to study when there are other interesting things to do

Always concentrate on school subjects during class

Take good notes during class instruction

Use the library to get information for class assignments

Plan my schoolwork for the day

Organize my schoolwork

Remember well information presented in class and textbooks

Confidence (0 – 100)
Arrange a place to study without distractions

Get myself to do school work
### APPENDIX B

**SELF SCALE (CAMPILLO-MEES, KITSANTAS, & ZIMMERMAN, 2005)**

**INSTRUCTIONS:** Using the scale provided, please indicate how much each of the following statements reflects how you typically are. There is no right or wrong answer.

<table>
<thead>
<tr>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely Cannot Do it</td>
<td>Probably Cannot</td>
<td>Maybe</td>
<td>Probably Can</td>
<td>Definitely Can Do It</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. When you miss a class, can you find another student who can explain the lecture notes as clearly as your teacher did?

2. When a lecture is especially boring, can you motivate yourself to keep good notes?

3. When you had trouble understanding your instructor’s lecture, can you clarify the confusion before the next class meeting by comparing notes with a classmate?

4. When you are taking a course covering a huge amount of material, can you condense your notes down to just the essential facts?

5. When another student asks to study together for a course in which you are experiencing difficulty, can you be an effective study partner?

6. When problems with friends and peers conflict with schoolwork, can you keep up with your assignments?

7. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work?

8. When you discover that your homework assignments for the semester are much longer than expected, can you change your other priorities to have enough time for studying?

9. When you have to take a test in a school subjects you dislike, can you find a way to motivate yourself to earn a good grade?

10. When your last test results were poor, can you figure out
<table>
<thead>
<tr>
<th></th>
<th>potential questions before the next test that will improve your score greatly?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>When you think you did poorly on a test you just finished, can you go back to your notes and locate all the information you had forgotten?</td>
</tr>
<tr>
<td>12.</td>
<td>When you find that you had to “cram” at the last minute for a test, can you begin your test preparation much earlier so you won’t need to cram the next time?</td>
</tr>
</tbody>
</table>
APPENDIX B-1

QUESTIONS EXCLUDING FROM SELF

Questions excluded from the Abbreviated SELF

When your teacher’s lecture is very complex, can you write an effective summary of your original notes before the next class?

When you have trouble studying your class notes because they are incomplete or confusing, can you revise and rewrite them clearly after every lecture?

When you are trying to understand a new topic, can you associate new concepts with old ones sufficiently well to remember them?

When you find yourself getting increasingly behind in a new course, can you increase your study time sufficiently to catch up?

When you have trouble recalling an abstract concept, can you think of a good example that will help you remember it on the test?

When you are feeling depressed about a forthcoming test, can you find a way to motivate yourself to do well?

When you are struggling to remember technical details of a concept for a test, can you find a way to associate them together that will ensure recall?
APPENDIX C

PROJECT ARTIFACTS

Name__________________  Business Artifact A

Driving Question:  What is necessary to run a successful business?
There will be an essential question that will be used to help you create this artifact.

    Essential Question for Artifact A:  How do you create a business product that
    people want to buy?

In order to answer the essential question for artifact A, I need to know this to meet the
challenge I've accepted –


As a whole class, we will generate questions about the creating a business product
that will help us think more about the driving question.
<table>
<thead>
<tr>
<th></th>
<th>5</th>
<th>4.0 – 4.5</th>
<th>3.5</th>
<th>3 or below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Justifies Business</td>
<td>Provides significant reasons in a</td>
<td>Provides reasons for why the product</td>
<td>States why the product should be bought.</td>
<td>Somewhat states why the product should be bought.</td>
</tr>
<tr>
<td>Product(s)</td>
<td>clear and convincing manner why the</td>
<td>should be bought.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>product should be bought.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research (evidence</td>
<td>Extensive evidence is provided on why</td>
<td>Evidence is provided on why this</td>
<td>Some evidence is provided, but could be</td>
<td>Little or no evidence is provided.</td>
</tr>
<tr>
<td>provided)</td>
<td>this product should be made.</td>
<td>product should be made.</td>
<td>explained in more detail.</td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td>Clear description of the product is</td>
<td>Products are described of what will be</td>
<td>Products are described.</td>
<td>Products are somewhat described.</td>
</tr>
<tr>
<td></td>
<td>provided with made with significant</td>
<td>made with detail.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>detail.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade: _____ / 15 pts x 2= _____ / 30 pts  Comments: __________________________
ID ___________________________

“On a scale from 0 – 100, how sure are you that you can achieve your desired goal on this project artifact A?”

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0  10  20  30  40  50  60  70  80  90  100

Cannot do at all     Moderately can do     Highly certain can do
Name__________________ Business Artifact B

Driving Question: What is necessary to run a successful business?
There will be an essential question that will be used to help you create this artifact.

Essential Question for Artifact B: How do you create a budget to run a successful business?

<table>
<thead>
<tr>
<th>In order to answer the essential question for artifact B, I need to know this to meet the challenge I've accepted –</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

As a whole class, we will create questions about the creating a business product that will help us think more about the driving question.
Artifact B (continued)

<table>
<thead>
<tr>
<th></th>
<th>5</th>
<th>4.0 – 4.5</th>
<th>3.5</th>
<th>3 or below</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Budget</strong></td>
<td>A comprehensive budget is created that includes all items.</td>
<td>For the most part, the budget is created that includes all items.</td>
<td>The budget somewhat includes all items.</td>
<td>The budget has a significant portion of the items missing.</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>All calculations are accurate and it does not go over their budget amount.</td>
<td>For the most part, the calculations are accurate and the student does not go over the budget amount.</td>
<td>The calculations are somewhat accurate and do not go over the budget amount.</td>
<td>Few or none of the calculations are accurate or exceeds the budget amount.</td>
</tr>
</tbody>
</table>

Grade: __________ / 10 pts x 2 = __________ / 20 pts  
Comments: ___________________
ID ____________________________

“On a scale from 0 – 100, how sure are you that you can achieve your desired goal on this project artifact B?”

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0  10  20  30  40  50  60  70  80  90  100

Cannot do at all       Moderately can do       Highly certain can do
Name__________                                Business Artifact C

**Driving Question:** What is necessary to run a successful business?
The essential question below will be used to help you create this artifact.

**Essential Question for Artifact C:** How does a successful business market their products and stand-out to customers?

<table>
<thead>
<tr>
<th>In order to answer the essential question for artifact C, I need to know this to meet the challenge I’ve accepted --</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

As a whole class, we will create questions to help think about the essential question.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
### Artifact C (continued)

<table>
<thead>
<tr>
<th></th>
<th>9.0 – 10 (A)</th>
<th>8 – 8.5 (B)</th>
<th>7 – 7.5 (C)</th>
<th>6 or below (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authentic and professional</td>
<td>The project demonstrates an authentic and professional business.</td>
<td>For the most part, the project demonstrates an authentic and professional business.</td>
<td>The project somewhat demonstrates an authentic and professional business.</td>
<td>The project lacks an authentic and professional business.</td>
</tr>
<tr>
<td>_____ / 10 pts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation and Design</td>
<td>The presentation and design of the project are well organized.</td>
<td>For the most part, the presentation and design of the project are well organized.</td>
<td>The presentation and design are somewhat well organized.</td>
<td>The presentation and design lack organization.</td>
</tr>
<tr>
<td>_____ / 10 pts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive (Convincing customers they must buy your product)</td>
<td>The project convinces customers that they must buy their products.</td>
<td>For the most part, the project convinces customers that they must buy their products.</td>
<td>The project somewhat convinces customers that they must buy their products.</td>
<td>The project lacks convincing language that they must buy their products.</td>
</tr>
<tr>
<td>_____ / 10 pts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grade: _____ / 30 pts $\times 2 = _____ / 60$ pts

Comments: _____________________
“On a scale from 0 – 100, how sure are you that you can achieve your desired goal on this project artifact C?”

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0  10  20  30  40  50  60  70  80  90  100

Cannot do at all   Moderately can do   Highly certain can do
Name___________  

Business Artifact D

You are writing a report to your CEO about how you understand the driving question, “What is necessary to run a successful business?” Answer this driving question by providing specific examples of what you learned during this unit. A few prompts that may be helpful in you answering the question are below:

- How did you design your product and project?
- How did you use your understanding of important business and economic concepts to help you with Business Day?
- What are lessons learned that can help you run a successful business in the future?
- How does the way you presented your products and explanation of your business play a role in it?

Remember that you are trying to persuade your CEO that you know how to run a successful business.

Brainstorm below:
Artifact D (continuation)

<table>
<thead>
<tr>
<th></th>
<th>9 – 10 (A)</th>
<th>8 – 8.5 (B)</th>
<th>7 – 7.5 (C)</th>
<th>6 or below (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answers the driving question</strong></td>
<td>The student provides a clear and convincing answer to the driving question.</td>
<td>For the most part, the student provides a clear and convincing answer to the driving question.</td>
<td>The student somewhat provides a clear answer to the driving question.</td>
<td>The student does not fully answer the driving question.</td>
</tr>
<tr>
<td>_____ / 10 pts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Specific examples &amp; details</strong></td>
<td>The student provides specific examples and details from the project and personal experiences to explain their answers.</td>
<td>For the most part, the student provides details from the project and personal experiences to explain their answers.</td>
<td>The student somewhat provides details from the project and personal experiences.</td>
<td>The student lacks details to answer the driving question.</td>
</tr>
<tr>
<td>_____ / 10 pts</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Grade: _____ / 20 pts x2 = 40pts  
Comments: _________________________________
APPENDIX D
CONTENT KNOWLEDGE TEST

Name__________________        Business Quiz

Directions: Choose the best answer for each question.

_____ 1. In the circular flow between consumers (households) and businesses (producers) in the U.S…
   A. Governments never provide goods and services
   B. Governments use tax revenue to provide goods and services
   C. Governments control the flow
   D. Governments play no role

_____ 2. Financial institutions encourage savings and investing by providing…
   A. checking accounts         B. stocks and bonds
   C. interest on deposits      D. loans to consumers

_____ 3. Private financial institutions provide the link between…
   A. stocks and bonds          B. banks and the Federal Reserve
   C. individuals and taxes     D. savers and borrowers

_____ 4. In the U.S., a person’s income is taxed in order to provide…
   A. capital for business expansion  B. government bonds and securities
   C. public goods and services     D. campaign finances
5. “Road Construction on Broad Street to Begin This Summer.” The headline is an example of a(n)…

A. incentive  B. opportunity cost  C. private ownership  D. public good or service

6. Which of the following is an action that could be taken by the Federal Reserve?

A. increase taxes  B. borrow less money  
C. change the reserve requirements  D. spend more on public goods and services

7. Which action is likely to slow the economy?

A. an increase in government spending  B. a decrease in the discount rate  
C. a decrease in the reserve requirements  D. an increase in taxes.

8. What amendment authorized (gave power to) Congress to tax incomes?

A. 1st  B. 5th  C. 14th  D. 16th

9. How can government promote marketplace competition?

A. Support business start-ups  B. Prohibit foreign trade  
C. Increase taxes  D. Encourage monopolies

10. Guidelines to protect public health and safety are implemented by…

A. government agencies  B. private citizens  
C. consumer rights’ groups  D. the media

11. If you feel a company’s product has caused you harm you…

A. have no legal option  B. must ask the government to investigate  
C. may take legal action against them  D. have thirty days to ask for a refund
12. One of the main jobs of the FED is
A. regulating the amount of tax each person pays.
B. regulating the amount of money in circulation (money supply).
C. prosecuting counterfeiters.
D. coining money.

13. Which of the following agencies has the power to bring any company that uses false or misleading advertising to court?
A. Federal Deposit Insurance Corporation
B. Federal Reserve System
C. Environmental Protection Agency
D. Federal Trade Commission

Title?
• Coins
• Federal Reserve notes (currency)
• Deposits in bank accounts that can be accessed by checks and debit cards.

14. Which of the following best describes the title above?
A. Types of Financial Institutions
B. Types of Money
C. Economic Flow Chart
D. Types of Consumers and Producers

15. Governments produce public goods and services because
A. U.S. businesses refuse to produce them
B. Individual businesses are forbidden by law from delivering public services
C. The Constitution of the U.S. requires it
D. Individuals acting alone could not produce them efficiently

16. What is the most important source of financial capital for business expansion in the United States economy?
A. Individuals and businesses savings and investment
B. Opportunity costs
C. Consumer sovereignty
D. Taxes paid by the state & federal gov’t
17. The type of business organization that limits the owners’ risk to the amount of money invested is

A. a corporation.  B. an entrepreneurship.  
C. a proprietorship.  D. a partnership.

18. The circular flow of economic activity includes interactions between all EXCEPT


- One owner
- Takes all risks
- Takes all profits

19. What type of business organization is characterized by the list above?

A. Corporation  B. Cooperative  C. Proprietorship  D. Partnership

20. Which completes the title above?

A. Sole proprietorship  B. Partnerships  
C. Private financial institutions  D. Public goods and services
APPENDIX E
PROJECT ARTIFACT REFLECTIONS

Student’s Name:______________  Project Artifact Reflection A - C

This assignment allows you to reflect on your project artifact. Ask yourself the following questions prompts on the left side before putting your answers on the right side.

<table>
<thead>
<tr>
<th>Forethought prompts:</th>
<th>Forethought: Before the actual performance or project artifact, what strategies worked well for you to prepare to meet your goals or project artifact?</th>
</tr>
</thead>
<tbody>
<tr>
<td>For example, “How well did I…?”</td>
<td></td>
</tr>
<tr>
<td>*Set short and long term and realistic goal(s) (example: S-M-A-R-T- goal) *Use a strategic planner or method to plan ahead *How do I feel about my ability to do well on this project?</td>
<td></td>
</tr>
</tbody>
</table>
**Performance prompts:**
For example, “How well did I...?”

* self-monitored my work and behavior to focus
* use task strategies to focus your attention on important ideas
* use imagery to picture what you expect the outcome to be based on criteria given
* use treats to motivate; positive reinforcement
* move away from distractions to help me focus or complete work

**Performance:** While working on the project artifact, what strategies did you use to monitor and focus on completing the assignment?

**Self-Reflection prompts:**
For example, “How well did I...?”

* use my time
* use the checklist to see what I did well and still need to do
* use my Project Calendar to reflect on performance
* seek help from others when needed

**Self-Reflection:** When reviewing my current work or project artifact, did I achieve my goal? Why or why not? What action will I take to make continuous improvement?
Plan of Action prompts:
For example, “I will…

* plan ahead by setting goals
* monitor my work by reviewing each part of the rubric
* seek help or ask questions when I need it
* continue

Plan of Action: Based on your self-reflection response, describe your plan of action (what you will do this week or weeks ahead) to continue your current progress or change to improve your work.

Rate your degree of value by recording a number from 0 to 100 using the scale given below:

<table>
<thead>
<tr>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not very Satisfied</td>
<td>Moderately Satisfied</td>
<td>Very Satisfied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The degree to which I value the artifact(s) I worked on is ______ out of 100. Explain how much you value the artifact(s) you worked on. Why?

________________________________________________________________________

________________________________________________________________________
### APPENDIX F

## INTERVENTION UNIT PLAN

<table>
<thead>
<tr>
<th>Lesson Sequence</th>
<th>Treatment</th>
<th>Research Supporting Intervention</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td><strong>Administer surveys</strong> - Children’s Self-efficacy for Self-regulated learning (Bandura, 2006) and the Self Scale (Campillo, Mees, Kitsantas &amp; Zimmerman, 2005). Collect both surveys. <strong>Introduction to Self-Regulation Learning (SRL) PowerPoint Slides 1 -10</strong> – Question – What do the words SRL mean? -Students individually and then in groups answer questions about previous experiences to activate prior knowledge about challenging experiences - Explain what SRL is and is NOT - Shift Happens Video (YouTube) – The need for SRL. -Examples of how SRL works in daily life and teaching and sharing specific strategy instruction – the when, how and why to apply strategies is necessary for SRL (Paris &amp; Winograd, 1999)</td>
<td><strong>Administer surveys</strong> - Children’s Self-efficacy for Self-regulated learning (Bandura, 2006) and the Self Scale (Campillo, Mees, Kitsantas, &amp; Zimmerman, 2005). Collect both surveys. <strong>Judicial Branch Activity and Review Overview of Mock Trial Simulation</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Day 2 | **Introduction to Self-Regulation Learning (SRL) PowerPoint Slides 11 – 16**  
- Review previous lesson by discussing SRL and what it is and discussing Zimmerman’s SRL model  
- Forethought – discuss beliefs and planning  
- Students individually respond to question on slide 12 and then pair share their answers leading to a group discussion  
- Individual review and then group discussion of quotes  
- Discussion on self-efficacy  
- Answer and discuss ‘Why Plan?’ on slide 16  
**Overview of Mock Trial Simulation Strategic Planner** - Teacher models how to complete a strategic planner related to Forethought notes (SRL PPT) and students write in the group discussion answers  
**Homework:** Judicial Branch Study Guide | Students should be explicitly taught the SRL cyclical model and processes (Zimmerman et al, 1996)  
Initially direct instruction has shown to be the most successful strategy for encouraging students to be self-regulative (Levy, 1996) | **Work on Mock Trial Judicial Branch Study Guide** |
| Day 3 | **Introduction to Self-Regulation Learning (SRL) PowerPoint Slides 17 – 24**  
- Review previous lesson by having students write down what forethought and self-efficacy mean and what they are used for in the classroom  
- Performance Phase – explanation of 2 parts  
  - Examples of Self-Control – Discuss and Model – Then students answer a Q  
  - Self-Observation – Question and answer  
  - Metacognition – Question and answer  
  - Self-Reflection Phase – Question and answer  
  - Self-Reflection Phase  
  - Self-test: Review of Terms/Concepts/Qs – Students will practice self-monitoring by putting a check plus (know well), check (somewhat) and check minus (do not know) – Review and discuss  
| Direct instruction means explicitly explaining and show the strategies and how they are used – it involves modeling and demonstrating (Zimmerman, 2008)  
  - When teachers model their thought process, students are more likely to begin to use those same processes (Boekaerts & Corno, 2005)  
  - Successful interventions provide students a “tool box” of various strategies they can employ on academic tasks (Paris & Winograd, 1999)  
| **Review Judicial Branch study guide**  
**Mock Trial Lesson** - Create attorney questions and witness answers from statements  
**Work on Mock Trial**  
| Day 4 | **SMART Goal PPT** – all 8 slides  
  - Discussion and practice writing a SMART goal  
  - Practice completing a | Planning occurs in setting a goal, establishing strategies needed to achieve the goal and allocating  
| **Work on Mock Trial Judicial Branch Quiz** |
| Day 5 | **SRL warm-up:** Review of concepts  
Introduction to SRL  
Resource Page (Appendix M)  
Complete a **Progress Feedback Form** – Create a checklist for project  
**Mock Trial** – Procedural steps of the trial and practice | Progress Feedback Form  
**Judicial Branch Quiz**  
**Work on Mock Trial**  
- Complete the different parts of the Progress Feedback Form  
- Complete the different parts of the Progress Feedback Form  
- Complete the needed resources and time (Schunk, 2001)  
- Students who set proximal instead of distal goals can demonstrate their progress in a more concrete way which increases efficacious and skill development (Schunk, 1983).  
- Students need to have multiple SMART goals to monitor their actions and make continuous improvement which allows for students to see success or failure based not on one goal (Ford, 1995).  
- Research has shown that Progress feedback (Duijnhouwer, Prins, & Stokking, 2010) is most effective when it includes what students did well and need to improve and what actions they can take (Black & William, 1998; Hattie & Timperley, 2007)  
- Progress feedback can support academic motivation (Wigfield, Klauda, & Cambria, 2010) | **Mock Trial** – Procedural steps of the trial  
**Practice** |
| Day 6 | **Mock Trial**  
(approximately 45 minutes)  
**Introduction to Executive Branch Project** – Brainstorm ideas about the driving question: Does the president have too much power?  
**Whole class discussion** – create questions about the president that will help students think more about the driving question  
**Students select a forethought strategy** (e.g. outline, SMART goal, strategic planner) to help them prepare for the project  
Guided practice is an important for helping students take more responsibility and it can help improve SRL and motivation (Lee et al., 2010). | **Mock Trials**  
(approximately 45 minutes)  
**Introduction to Executive Branch Project** – Brainstorm ideas about the driving question: Does the president have too much power?  
**Students begin working on the project** |
| Day 7 | **Mock Trial**  
(approximately 45 minutes)  
**Progress Feedback Form** - Students use the SRL Resource Page to help them  
**Executive Branch Notes**  
**Work on Project** - Independently or collaborate with others on project to answer the driving question  
Complete a review assignment for hwk  
Independent practice is needed for students to practice their own strategy use and receive feedback. This helps students gain autonomy and confidence (Schunk & Zimmerman, 2007). | **Mock Trial**  
(approximately 45 minutes)  
**Executive Branch Notes**  
**Work on Project** - Independently or collaborate with others on project to answer the driving question |
| Day 8 | **Review Zimmerman’s 3 phase model -complete a progress feedback form**  
**Model and discuss strategies** they can use in Students need to practice SRL strategies in an authentic environment (e.g. practice on the Executive Branch unit | **Work on project**  
Complete a review assignment |
| Day 9 | Executive Branch Quiz  
Work on Executive Branch Project –  
Review goals and SRL processes  
**Calvin and Hobbes Cartoon**  
-Students answer the questions to the cartoon independently  
**Exit card:** What are the important aspects of SRL? What do you still not understand? | Strategy use must be observable – discussion and supportive (Paris & Winograd, 1999) | Executive Branch Quiz  
Work on Executive Branch Project |
| --- | --- | --- | --- |
| Day 10 | Complete a Task Reflection by using the SRL Resource Page – group discussion after  
**Share Executive Branch Project** (briefly)  
**Calvin and Hobbes Cartoon**  
-Students answer the questions to the cartoon independently  
**Exit card:** What are the important aspects of SRL? What do you still not understand? | Students must have time to practice strategies independently, reflect and internalize them (Zimmerman, 1998). | Share Executive Branch Project  
Go over Executive Branch Project  
Organize Cover Page materials |
APPENDIX G

SRL POWERPOINT

1. Introduction to Self-regulation Learning (SRL)

2. Questions
   Q1: When completing a challenging long-term task in sports, music, or school, what actions do you take to help you complete it?
   Q2: What actions could you take to help you be even more successful?

3. Quote
   “Efforts and courage are not enough without purpose and direction.” –J.F. Kennedy
   What is meant by this quote?

4. Self-Regulation Learning
<table>
<thead>
<tr>
<th>What it is...</th>
<th>What it is NOT...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental (thinking) process</td>
<td>Doing an activity with no clear purpose or goals</td>
</tr>
</tbody>
</table>

212
5. **What is it...**
- Goal creation helps to focus energy
- Continuous self-checks to ensure best work
- Self-evaluating work to goal

6. **What it is NOT...**
- Completing a task with no specific direction
- Not checking to make sure you are meeting the requirements

7. **Why SRL?**

   **Shift Happens Video:**
   [http://www.youtube.com/watch?v=WVQ4LJfQ2esw](http://www.youtube.com/watch?v=WVQ4LJfQ2esw)

President Obama demanded that states develop standards that don’t simply measure whether students can fill in a bubble on a test but whether they possess 21st century skills like problem-solving and critical thinking, entrepreneurship and creativity” (Keck, 2009, p.1)

Respond to the video and your thoughts from the quote from President Obama.

8. **Examples of how SRL Model Can Work**
- Study Log (show)
- Sports
- Musical Performance
- Long-term project

9. **How can a student become more self-regulated to complete his or her work?**

10. **What does SRL look like?**

    Zimmerman and Moylan’s SRL Model (2009)

    - Task strategies: self-regulated, planning, managing, and monitoring
    - Self-regulated learning: self-regulation, self-motivation, and self-evaluation

    ![Diagram of SRL Model](image-url)

11. 12.
13. **Forethought**

Before the actual performance or task; sets the stage for learning (Prefix – “Fore” means before)

- Beliefs

- Planning

14. **Question**

There are two students in a classroom. One math student believes he is capable of completing a challenging word problem. The other student does not believe he is capable of completing it. Who will do a better job? Why?

15. **What do these quotes mean to you?**

“If I have the belief that I can do it, I shall surely acquire the capacity to do it even if I may not have it at the beginning.” – Mahatma Gandhi

“Whether you think that you can or can’t, you’re usually right.” – Henry Ford

“People’s level of motivation, affective states and actions are based on what they believe than what is objectively the case.” – Bandura (1997)

16. **Self-efficacy**

Self-efficacy – how capable you think you are to do something specific – ex: do well on a math test.

People who have high self-efficacy in math are confident in their ability to do well and take more risks and spend more time studying and preparing for math.

17. **Why Plan?**

18. **Performance Phase**

Working on completing a task by using strategies to monitor and concentrate on completing the task (knowing what you are and are not doing).

“Great things only come with great effort” – RG III

There are two major parts to the Performance Phase: Self-Control and Self-recording.
Examples of Self-Control in the Performance Phrase

Self-Control

1. Imagery

- Self-instruction – self-talk to increase persistence and sustain effort
- Ex: Children will use private speech to consciously understand or focus on a problem or situation and to overcome difficulties.

- Task strategies – underlining, highlighting, creating a calendar, using an agenda

Question: Have you used these strategies before? When? How?

Self-Observation

Two parts

- Part 1: Self-observation
  - Self-recording – checklists

Question: When have you used checklists? Did you find it useful? Why or why not?

Self-Reflection Phase

Look back on your planning and your actions to determine success or adjustments that need to be made to your process.

Two Parts: Self-judgment and Self-reaction

Self-judgment

- Self-evaluation – comparing our performance to an expectation or to our peers

Self-reflection

- Causal attribution – what caused the performance
- Self-reaction – how a person acts during a situation or outcome

Characteristics of SRL Students

- Self-regulated learners complete the following at the end of a work session or assignment to ensure continuous improvement:
  - Evaluate their performance based on their __________ created
  - Determine the ____________
  - Make adjustments to either ensure the same outcome or secure a more positive experience

Metacognition

*Part 2: Metacognition – thinking about your own thinking*

In other words, an ability to control one’s learning by understanding and reflecting upon it:

1. Awareness of what is known and not known and what one wants to know.
2. Awareness of what is required to complete them.
3. Awareness of to direct action to meet the desired goals.

*Question: Have you used metacognitive strategies before?
Self-Test: Review of Terms/Concepts/Qs

- Self-regulation learning (SRL)
- Why SRL?
- Forethought Phase
- Self-efficacy
- Performance Phase
- Self-recording
- Metacognition
- Self-Reflection Phase
- Self-evaluation

References


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APPENDIX H
GOALS POWERPOINT

1. SMART Goals
   - What are SMART goals?
   - Why use SMART goals in school and personal life?
   - How do you write SMART goals?

2. What are SMART goals?
   - Goals are something that you want to achieve in the future (short or long term)
   - S specific
   - M measurable
   - A attainable
   - R realistic
   - T timely

3. Why SMART goals?
   - (1) Help you determine what is most important and concentrate your energy on the task.
   - (2) Defines exactly what the “future state” looks like and how it will be measured.
   - (3) Helps with persistence and commitment when facing distractions or challenges.

4. How do you write SMART goals?
   - Reflect on the greatest areas in need of improvement.
   - Specific: You should be clear about the results you want.
   - Not Specific: I want to make many free throw shots.
   - Specific: I want to have a 70% of my free throw shots in the next four games.
5. How do you write SMART goals?
   - **Measurable** - You should be able to track your goal and quantitative it.
     - ☐ Not Measurable: I want to make a lot of free throw shots.
     - ☐ Measurable: I want to make at least 7 out of 10 free throw shots in the next three basketball games.

6. How do you write SMART goals?
   - **Attainable** - How can you make this happen? What do you need to do?
     - ☐ Incorrect: In order to achieve my goal, I need to eat Doritos.
     - ☐ Correct: In order to achieve my goal, I need to practice 5 out of 7 days for 20 minutes on free throws.

7. How do you write SMART goals?
   - **Realistic** - Can you achieve these goals? Is it doable?
     - ☐ Unrealistic: I want to make 20 free throw shots in one game
     - ☐ Realistic: I want to make 7 out of 10 of the free throw shots that I attempt in four games.

8. How do you write SMART goals?
   - **Timely** - You should set a timeframe for your goal.
     - ☐ No time: I want to achieve my goal.
     - ☐ Time: I want to score consistently at least 70% in the next four games or four weeks.

9. Your Turn

10. Classroom Example
    - **Mock Trial Project**
      - **S** – To complete the mock trial fact sheet.
      - **M** – By creating detailed notes.
      - **A** – Highlight key words and complete it during the 25 mins for working on the project.
      - **R** – Check my understanding of the facts with my partner.
      - **T** – Turn it in for the next class.
Classroom Example
Mock Trial Project

- Put the classroom example into a complete sentence.
- Now it is your turn to write your own SMART goal on the most important need you have personally or in school.

References

APPENDIX I

BUSINESS UNIT SOL STANDARDS

CE. 11a – The student will demonstrate knowledge of how economic decisions are made in the marketplace by

a) applying the concepts of scarcity, resources, choice, opportunity cost, price, incentives, supply and demand, production and consumption.

c) Describing the characteristics of the United States economy, including limited government, private property, profit and competition.

CE. 12a – The student will demonstrate knowledge of the structure and operation of the United States economy by

a) Describing the type of business organizations and the role of entrepreneurship

b) Explaining the circular flow that shows how consumers (households), businesses (producers), and markets interact.

c) Explain how financial institutions channel funds from savers to borrowers.

CE. 13 The student will demonstrate knowledge of the role of government in the United States economy by

a) examining competition in the marketplace.

b) explaining how government provides certain goods and services.
c) describing the impact of taxation, including an understanding of the reasons for the 16th Amendment, spending and borrowing.

d) explaining how the Federal Reserve System acts as the nation’s central bank.

e) describing the protection of consumer rights and property rights.

f) recognizing that government creates currency and coins and that there are additional forms of money.

CE. 14 The student will demonstrate knowledge of personal finance and career opportunities by

a) identifying talents, interests, and aspirations that influence career choice;

f) examining the financial responsibilities of citizenship, including evaluating common forms of credit, savings, investments, purchases, contractual agreements, warranties, and guarantees.
APPENDIX J

A SCANS REPORT FOR AMERICA 2000 EXCERPT

A THREE-PART FOUNDATION

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

A. Reading — locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules

B. Writing — communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts

C. Arithmetic/Mathematics — performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques

D. Listening — receives, attends to, interprets, and responds to verbal messages and other cues

E. Speaking — organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

A. Creative Thinking — generates new ideas

B. Decision Making — specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative

C. Problem Solving — recognizes problems and devises and implements plan of action

D. Seeing Things in the Mind’s Eye — organizes, and processes symbols, pictures, graphs, objects, and other information

E. Knowing How to Learn — uses efficient learning techniques to acquire and apply new knowledge and skills
F. Reasoning — discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

**Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty**

A. Responsibility — exerts a high level of effort and perseveres towards goal attainment

B. Self-Esteem — believes in own self-worth and maintains a positive view of self

C. Sociability — demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings

D. Self-Management — assesses self accurately, sets personal goals, monitors progress, and exhibits self-control

E. Integrity/Honesty — chooses ethical courses of action

**FIVE COMPETENCIES**

**Resources: Identifies, organizes, plans, and allocates resources**

A. Time & Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules

B. Money & Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives

C. Material and Facilities & Acquires, stores, allocates, and uses materials or space efficiently

D. Human Resources & Assesses skills and distributes work accordingly, evaluates performance and provides feedback

**Interpersonal: Works with others**

A. Participates as a Member of a Team & contributes to group effort

B. Teaches Others New Skills

C. Serves Clients/Customers & works to satisfy customers’ expectations
D. Exercises Leadership & communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies

E. Negotiates & works toward agreements involving exchange of resources, resolves divergent interests

F. Works with Diversity & works well with men and women from diverse backgrounds

Information: Acquires and uses information

A. Acquires and Evaluates Information

B. Organizes and Maintains Information

C. Interprets and Communicates Information

D. Uses Computers to Process Information

Systems: Understands complex inter-relationships

A. Understands Systems & knows how social, organizational, and technological systems work and operates effectively with them

B. Monitors and Corrects Performance & distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems’ performance and corrects malfunctions

C. Improves or Designs Systems & suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

A. Selects Technology & chooses procedures, tools or equipment including computers and related technologies

B. Applies Technology to Task & Understands overall intent and proper procedures for setup and operation of equipment

C. Maintains and Troubleshoots Equipment & Prevents, identifies, or solves problems with equipment, including computers and other technologies.
APPENDIX K

VIRGINIA WORKPLACE READINESS SKILLS

Workplace Readiness Skills for the Commonwealth
Needs Identified by Virginia Employers

Personal Qualities and People Skills

1. POSITIVE WORK ETHIC: Comes to work every day on time, is willing to take direction, and is motivated to accomplish the task at hand

2. INTEGRITY: Abides by workplace policies and laws and demonstrates honesty and reliability

3. TEAMWORK: Contributes to the success of the team, assists others, and requests help when needed

4. SELF-REPRESENTATION: Dresses appropriately and uses language and manners suitable for the workplace

5. DIVERSITY AWARENESS: Works well with all customers and coworkers

6. CONFLICT RESOLUTION: Negotiates diplomatic solutions to interpersonal and workplace issues

7. CREATIVITY AND RESOURCEFULNESS: Contributes new ideas and works with initiative

Professional Knowledge and Skills

8. SPEAKING AND LISTENING: Follows directions and communicates effectively with customers and fellow employees

9. READING AND WRITING: Reads and interprets workplace documents and writes clearly
10. CRITICAL THINKING AND PROBLEM SOLVING: Analyzes and resolves problems that arise in completing assigned tasks

11. HEALTH AND SAFETY: Follows safety guidelines and manages personal health

12. ORGANIZATIONS, SYSTEMS, AND CLIMATES: Identifies “big picture” issues and his or her role in fulfilling the mission of the workplace

13. LIFELONG LEARNING: Continually acquires new industry-related information and improves professional skills

14. JOB ACQUISITION AND ADVANCEMENT: Prepares to apply for a job and to seek promotion

15. TIME, TASK, AND RESOURCE MANAGEMENT: Organizes and implements a productive plan of work

16. MATHEMATICS: Uses mathematical reasoning to accomplish tasks

17. CUSTOMER SERVICE: Identifies and addresses the needs of all customers, providing helpful, courteous, and knowledgeable service

**Technology Knowledge and Skills**

18. JOB-SPECIFIC TECHNOLOGIES: Selects and safely uses technological resources to accomplish work responsibilities in a productive manner

19. INFORMATION TECHNOLOGY: Uses computers, file management techniques, and software/programs effectively

20. INTERNET USE AND SECURITY: Uses the Internet appropriately for work

21. TELECOMMUNICATIONS: Selects and uses appropriate devices, services, and applications

Source: Virginia Department of Education, 2010

APPENDIX L

PROGRESS FEEDBACK FORM

Name___________  Progress Feedback Form (bullet points only):

I. SMART Goal: ______________________________________________________

I will do my best to complete the following tasks in ____ minutes:

1.___________________________________ 2. __________ _________________

3.__________________________________

If you finish early: ______________________

II. How do I know if I am making progress toward my goal?

________________________________________________________________________

What do I still need to do?

________________________________________________________________________

III. Did I accomplish my SMART goal? Why or why not? Explain. ____________

________________________________________________________________________

Student participation grade:  5  4  3  2  1  Teacher part. grade:  5  4  3  2  1

Why did you give yourself that grade?

________________________________________________________________________
APPENDIX M

SRL RESOURCE PAGE

SELF-REGULATION LEARNING RESOURCE PAGE

FORETHOUGHT
What will I do before the actual performance or task to prepare myself?

- Create a smart goal
  - Specific: narrow and precise goal
  - Measurable: use a timeframe or action plan
  - Attainable: using a strategy, plan, or skills
  - Relevant: I have set aside three 20-minute work sessions to complete my assignment
  - Time-bound: Due Friday

- Calculate a daily list of goals that lead to larger goals
- Strategic Planning: methods to make a plan to get a task done

Performance
While working on the project, how will I manage and focus on completing the task?

- Self-monitoring: checklist (9, 3, 1) on a rating scale based on an evaluation to check your current progress
- Using or agenda or calendar to monitor progress
- Task strategies: different ways to focus your attention on important ideas
- Note-taking: use of color
- Self-instructions: task force through a problem or thinking through a situation
- Imagining picture what you expect the outcome to be based on the criteria
- 3 Tactic to motivate: positive reinforcement
- Environmental: the place where you do your work or study (away from distractions)

Self-Reflection
When reviewing my current work or task, did I achieve my goal? How or why not? What actions will I take to make continuous improvement?

- Self-Evaluation: ربما النقية checklist evaluate your work honestly before submitting it for final draft
- Attributions: what caused your performance?
  - When SRL students reflect, they focus on their effort, strategies they used or didn’t use, or did not do well—NOT ability
- Self-Reflection: how a person react during a situation or outcome
  - Help-seeking: “How do I seek help as asked questions that I need?”
APPENDIX N
STRATEGIC PLANNER

Name__________   Strategic Planner:

The task is _________________________________________

<table>
<thead>
<tr>
<th>Awareness of Knowledge:</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do I already know in order to complete this project? __________________________</td>
</tr>
<tr>
<td>______________________</td>
</tr>
<tr>
<td>______________________</td>
</tr>
<tr>
<td>______________________</td>
</tr>
</tbody>
</table>

| What do I still need to learn to complete this project? __________________________ |
| ______________________|
| ______________________|

<table>
<thead>
<tr>
<th>Awareness of Thinking:</th>
</tr>
</thead>
<tbody>
<tr>
<td>How will I solve this problem / task? What do I need to do to complete this task?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What specific tasks must I do to complete the entire project?</th>
<th>What resources or materials will I use to complete this project?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>Specific tasks</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Awareness of Thinking Strategies:**

What strategy (strategies) will you use to complete the steps in the project?  

__________________________________________________________________________

__________________________________________________________________________

How will you monitor the use of your strategies? Explain in bullet points.

__________________________________________________________________________

__________________________________________________________________________

How will I self-evaluate my work to ensure my best?

__________________________________________________________________________

__________________________________________________________________________
APPENDIX O

CALVIN & HOBBES CARTOON

Name_________ SRL Review: Calvin and Projects

Directions: Please read the Calvin and Hobbes cartoon and then respond to the questions below.

1. Do you believe Calvin is a self-regulated learner? Explain why or why not?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. What are Calvin’s academic strengths? (Bullet points) _____________________

________________________________________________________________________
________________________________________________________________________

3. What are Calvin’s areas for improvement? Be specific. (Bullet points)

________________________________________________________________________
________________________________________________________________________

4. If you were in Calvin’s position, explain the self-regulatory skills that you would use to complete the project. Be specific (review your answer to question 3) and refer to your notes.

________________________________________________________________________
## APPENDIX P

### SRL STRATEGY TEACHER GUIDE

SRL Strategy Teacher Guide:

<table>
<thead>
<tr>
<th>Forethought Phase Indicators</th>
<th>Performance Phase Indicators</th>
<th>Self-Reflection Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS = Goals or Goal Setting including SMART Goals</td>
<td>SM = Self-Monitor, check progress, look over materials</td>
<td>SE = Self-evaluation: Review rubric or checklist and evaluate work</td>
</tr>
<tr>
<td>C = Calendar</td>
<td>TS = Task Strategies, ways to focus your attention on important ideas – include underline, highlight</td>
<td>A = Attributions: Explain the reason for their performance – effort or strategy use</td>
</tr>
<tr>
<td>SP = Strategic Planner</td>
<td>SI = Self-Instruction, self-talk, talk yourself through a situation</td>
<td>SR = Self-Reaction: Reacts during a situation or outcome</td>
</tr>
<tr>
<td>O / OL = Outline / Organized List / List</td>
<td>I = Imagery: visualize the expected outcome</td>
<td>HS = Help Seeking: Ask questions or seek help</td>
</tr>
<tr>
<td>GO / W = Graphic Organizer or Web</td>
<td>T = Treats: ways to motivate or provide positive reinforcement</td>
<td></td>
</tr>
<tr>
<td>S = (Selecting a Strategy)</td>
<td>E = Environment: moving away from distractions, to a quiet area</td>
<td>M = Metacognition: thinking about your own thinking and what you are currently doing</td>
</tr>
</tbody>
</table>

*Plan of Action could be any of these indicators*
### APPENDIX Q

**ZIMMERMAN’S SRL STRATEGIES (1989)**

<table>
<thead>
<tr>
<th>Categories / Strategies</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Self-evaluating</td>
<td>Statements indicating student-initiated evaluations of the quality or progress of their work, e.g., “I check over my work to make sure I did it right.”</td>
</tr>
<tr>
<td>2. Organizing and transforming</td>
<td>Statements indicating student-initiated overt or covert rearrangement of instructional materials to improve learning; e.g., “I make an outline before I write my paper.”</td>
</tr>
<tr>
<td>3. Goal-setting and planning</td>
<td>Statements indicating students’ setting of educational goals or subgoals and planning for sequencing, timing, and completing activities related to those goals; e.g., “First, I start studying two weeks before exams, and I pace myself.”</td>
</tr>
<tr>
<td>4. Seeking information</td>
<td>Statements indicating student-initiated efforts to secure further task information from nonsocial sources when undertaking an assignment; e.g., “Before beginning to write the paper, I go to the library to get as much information as possible concerning the topic.”</td>
</tr>
<tr>
<td>5. Keeping records and monitoring</td>
<td>Statements indicating student-initiated efforts to record events or results; e.g., “I took notes of the class discussions”; I kept a list of the words I got wrong.”</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6.</td>
<td>Environmental structuring Statements indicating student-initiated efforts to select or arrange the physical</td>
</tr>
<tr>
<td>7.</td>
<td>Self-consequating Statements indicating student arrangements or imagination of rewards or punishment for success or failure; e.g., “If I do well on a test, I treat myself to a movie.”</td>
</tr>
<tr>
<td>8.</td>
<td>Rehearsing and memorizing Statements indicating student-initiated efforts to memorize material by overt or covert practice; e.g., “In preparing for a math test, I keep writing the formula down until I remember it.”</td>
</tr>
<tr>
<td>9 – 11.</td>
<td>Seeking social assistance Statements indicating student-initiated efforts to solicit help from peers (9), teachers (10), and adults (11); e.g., “If I have problems with math assignments, I ask a friend to help.”</td>
</tr>
<tr>
<td>12 – 14.</td>
<td>Reviewing records Statements indicating student-initiated efforts to reread notes (12), tests (13), or textbooks (14) to prepare for class or further testing; e.g., “When preparing for a test, I review my notes.”</td>
</tr>
</tbody>
</table>
APPENDIX R

CHILDREN'S ASSENT FORM

Supporting Student Project-based Learning through Self-Regulation Learning

ASSENT FORM

RESEARCH PROCEDURES

The purpose for this research is to find out how you plan and complete class projects. If you agree to take part in this study, you will be asked to complete two short surveys at the beginning of the study and two at the end. In addition, you may complete a weekly reflection form. The surveys will take 5-10 minutes to complete and the reflection form about 10 minutes.

Your decision to participate, or not participate in the study will have no influence on your grades or relationship with me, and I will not know who has decided to participate in the study until after the academic year is complete. You will turn in the consensus and assent forms to Mr. Rienzi or Mrs. Kuehn, and I will not know if you agreed to participate.

RISKS AND BENEFITS

There are no known risks for participating in this research. The things I find out may help you develop strategies to manage how you learn and manage your time. There are no rewards or money paid for being in this study. There are no known benefits.

CONFIDENTIALITY

For all materials for that unit, you will have a specific student identification number. All information will be kept in a safe and secure place. Your name and where you live will be changed so that no one will know who you are. I may use some of your words when I write my report, but I will never tell anyone your name.

PARTICIPATION

You do not have to participate if you do not want to for any reason. If you change your mind after we get the surveys and want to stop then it okay. I will not get mad and nothing will happen to you.

CONTACT

My name is Tony DiPpe, and I am studying to get a graduate degree in Educational Psychology at George Mason University. You can call me at this phone number (703) 720-5700 if you have any questions about this study. You can also call my professor, Dr. Anastasia Kuehn, a professor at George Mason University, at 703-993-2588. The George Mason University Office of Research Ethics Protection knows all about my research and will make it okay for me to do it. You can call them at 703-993-4121 if you have any questions about being a part of this research.

CONSENT

I have read this form and I agree to be part of this study.

Name: ____________________________ Date: ____________________________

Approval for the use of this document:

EXPIRES: ____________

MAR 04 2014

Protocol #: ____________________________

George Mason University

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APPENDIX R:

INFORMED PARENTAL CONSENT

Dissertation Study: Supporting Student Project-based Learning through Self-Regulation Learning

INFORMED CONSENT FORM

RESEARCH PROCEDURES
The reason for this research is to find out how your child plans and completes class projects. Your child will be asked to design and run a business by selling products to other classmates. If you agree to have your child take part in this study, he/she will be asked to complete two short surveys the first day of the study and two short surveys on the last day of the study. The study will last approximately 7-8 weeks. In addition, your child may complete a weekly reflection form. The surveys will take 5 – 10 minutes to complete and the reflections about 10 minutes.

RISKS
There are no foreseeable risks for participating in this research.

BENEFITS
There are no direct benefits, but this study may add to the general knowledge of the students understanding of Economics.

CONFIDENTIALITY
The data in this study will be confidential. Names and other identifiers will not be placed on surveys or other research data. To protect your child's identity, all participants will be issued a “participation number”, only this number will be used on the survey and other collected data. While the researcher will be able to use this number to link your survey to your identity only the researcher will have access to this information.

PARTICIPATION
Your child's participation is voluntary, and you may withdraw your child from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT
This research is being conducted for a dissertation by Rory Dippold, a student at George Mason University. He may be reached 703-720-5700 for questions or to report a research-related problem. To reach the course professor, Dr. Anastasia Kitsantas, please call 703-993-2688. You may also contact the George Mason University Office of Research Subject Protections at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

Approval for the use of this document expires

MAR 04 2016

Protocol # 8587

George Mason University

Revised 07/2005 1 of 2
CONSENT
I have read this form and agree for my child to participate in this study (for nonexempt research projects, include this statement and a place for the participant's signature and the date of signature).

Student’s Name

Parent/Guardian’s Name

Date of Signature

Date of Signature

Version date: 3/4/13

Approval for the use of this document expires
MAR 04 2014

Protocol #
George Mason University
APPENDIX T: IRB APPROVED LETTER

TO: Anastasia Kitsantas, College of Education and Human Development

FROM: Aurali Dade
       Assistant Vice President, Research Compliance

PROTOCOL NO.: 8587    Research Category: Doctoral Dissertation

PROPOSAL NO.: N/A

TITLE: Supporting Student Project-based Learning through Self-Regulation Learning

DATE: March 5, 2013

Cc: Rory Diippold

On 3/5/2013, the George Mason University Institutional Review Board (GMU IRB) reviewed and approved the above-cited protocol following expedited review procedures.

Please note the following:

1. A copy of the final approved consent document is attached. You must use this copy with the IRB stamp of approval for your research. Please keep copies of the signed consent forms used for this research for three years after the completion of the research.

2. Any modification to your research (including the protocol, consent, advertisements, instruments, funding, etc.) must be submitted to the Office of Research Integrity & Assurance (ORIA) for review and approval prior to implementation.

3. Any adverse events or unanticipated problems involving risks to subjects including problems involving confidentiality of the data identifying the participants must be reported to the ORIA and reviewed by the IRB.

The anniversary date of this study is 3/4/2014. **You may not collect data beyond that date without GMU IRB approval.** A continuing review form must be completed and submitted to the ORIA 30 days prior to the anniversary date or upon completion of the project. In addition, prior to that date, the ORIA will send you a reminder regarding continuing review procedures.

If you have any questions, please do not hesitate to contact me at 703-993-5381.
REFERENCES


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BIOGRAPHY

Rory B. Dippold graduated from the University of Notre Dame with a Bachelor of Arts degree in History and a Master’s in Education. He is a Nationally Board Certified Teacher who has taught for twelve years, primarily middle school social studies in a school division in Northern Virginia.