EXPLORING THE INTERPLAY BETWEEN PSYCHOSOCIAL LEARNING ENVIRONMENTAL FACTORS, MOTIVATION, AND SELF-REGULATION IN 9th -12th GRADE SCIENCE

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ABSTRACT

EXPLORING THE INTERPLAY BETWEEN PSYCHOSOCIAL LEARNING ENVIRONMENTAL FACTORS, MOTIVATION, AND SELF-REGULATION IN 9^{th} -12^{th} GRADE SCIENCE

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Students who once loved science are somehow losing the passion as they progress through their high school courses. There is a need to create science literate citizens; however, it is difficult to accomplish this task if students are not motivated to learn science during their high school years. As a result, this non-experimental, quantitative study examined 9^{th} -12^{th} grade student perceptions of the psychosocial learning factors within a science classroom and their impact on motivation and self-regulation to learn science concepts. Archival data from a convenience sample during the 2013-2014 school year was used for this study. The *What is Happening In This Class* (WIHIC) and *Students' Adaptive Learning Engagement in Science* (SALES) instruments were used to measure the relationships between the psychosocial learning factors, motivation, and self-regulation within a science classroom. Findings indicated there is a statistically significant positive relationship between student perceptions of the psychosocial learning environment and motivation to learn science. There is also a statistically significant positive relationship between student perceptions of the psychosocial learning environment and a student's self-regulation practices as they relate to learning science concepts. Additionally, there is evidence of a statistically significant relationship between grade level and student perceptions of the psychosocial learning environment.

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CHAPTER I

INTRODUCTION

"Most of us end up with no more than five or six people who remember us. Great teachers have thousands of people who remember them for the rest of their lives" (Andy Rooney, CBS television newsman).

Science is everywhere; it is in the food we eat, the cars we drive, and the clothes we wear. Almost everything around us uses science; whether it is auto repair shops, hair dressers, physicians, military, chefs, you name it and most likely one will find science in action. The State of Texas graduation plan (House Bill 5: Foundation High School Program) requires that all students earn a minimum of three credits in science (Texas House Bill 5, 2013). This foundation plan is for students who will not be attending a university after graduation. Texas House Bill 5 of 2013 (HB 5) also includes an endorsement program that offers student choice in the courses they may take based on their interests. The endorsement choices are Business/Industry, Public Services, Arts/Humanities, Multidisciplinary Studies, and Science, Technology, Engineering, and Math (STEM). All endorsements require students to earn an additional credit in science; however, STEM requires a 5^{th} year of science if the student focuses on the "S" in STEM (Texas House Bill 5, 2013). HB 5 goes on to state that each approved course must prepare students to, "enter the workforce successfully or postsecondary education without remediation" (Texas House Bill 5, 2013). While HB 5 offers the foundation plan as a minimum requirement for students to follow, schools and districts are penalized on their school report cards if too many students graduate on the foundation plan. Although this is not explicitly stated in HB 5, it is the expectation that all students will graduate with an endorsement, which requires all students to earn credit in at least four science courses (TEA, 2014). As a result, school districts in the State of Texas continue to follow the 4x4 plan, a previous requirement by the state, which requires all students to take four years of science, four years of math, four years of social studies, and four years of English (TEA, 2014). Those who elect to follow the foundation plan are required to complete an endorsement opt-out agreement, which must be signed by a parent/guardian and a school administrator (TEA, 2014).

Regardless of the plan or endorsement that is chosen, it is essential for students to recognize that science concepts are interwoven into every field. Art majors need a strong understanding of science behind paints, ceramics, glazing, canvases, and many other concepts. Public Service students need a background in science to assist patients, prepare foods, solve crimes, and even in keeping the public safe. Science helps Business and Industry students within manufacturing, tourism, public debates related to health care or the environment, and working with computers/technology (Kilgo, McLaughlin, Thompson, & Zike, 2015). In addition, while not every student will graduate with a passion to enter a science field, there is a critical need to ensure all students around the world become science literate citizens (Bryan, Glynn, & Kittleson, 2011; Feinstein, 2011; Logan & Skamp, 2008; Roberts, 2007). Science literate refers to the awareness of the interrelationship between the environment, society, humans, science, and technology (Yuenyong & Narjaikaew, 2009). Becoming science literate empowers the general nonscience population with knowledge to tackle science-related societal issues (Swarat, Ortony, & Revelle, 2012). Science literacy not only helps resolve science-related societal issues; it also impacts the economy (Logan & Skamp, 2008), national growth , and production of next generation scientists. According to Yenyong and Narjaikaew (2009), humanity needs to be aware of science related issues in order to make good decisions and to improve the quality of life. For example, an understanding of global warming, animal rights, and oil spills could alter a person's decisions that might impact the environment for future generations. In addition, becoming science literate increases one's ability to better evaluate scientific evidence used in advertisements (Liu, 2009; Yuenyong & Narjaikaew, 2009). In order to increase science literacy within society, there is a need to ensure high school students are actively involved in their science education (Feinstein, 2011).

Aschbacher, Ing, and Tsai (2013) contend students, who once enjoyed learning science at a young age, gradually lose interest in the content as they progress into high school; that is, students who once loved science somehow lost the passion by the time they graduate from high school. In fact, the study found that interest in science began as early as eight years old but stemmed from parental expectations, the urge to explore, and intrinsic motivation to ask why. The study also showed if students were not interested in science before entering seventh grade, they would most likely not gain interest in the future (Aschbacher et al.). As a result, the goal of increasing science literacy should begin before students enter the secondary grade levels (7-12).

In order to create a viable plan to increase science literacy at the high school level, researchers need to identify factors that exhibit the greatest impact on a high school student when it comes to engaging in science learning. A first-year teacher recently shared the following frustration with the researcher:

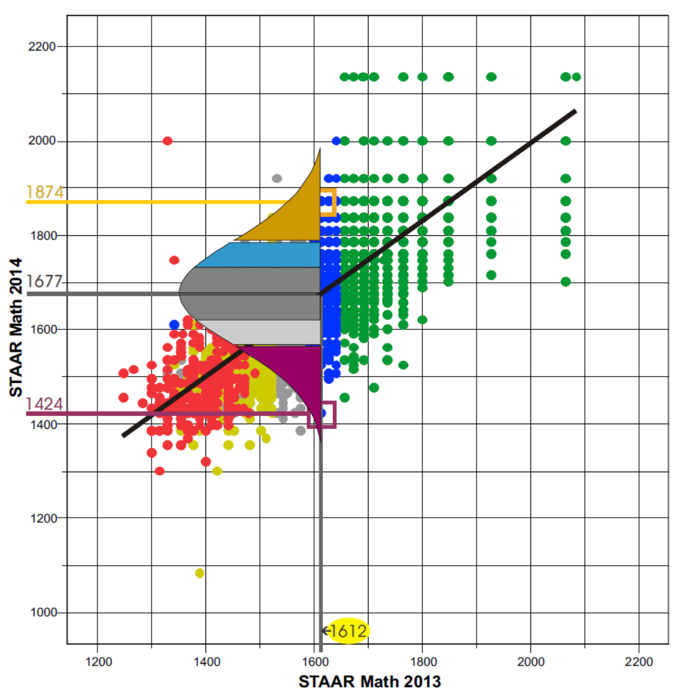
> This issue I am having is the lack of motivation. I have students who are thrilled to do a lab, and the same students who usually do nothing say the lab is ‘too much work’; they won’t even read the directions. I guess I need to find the line between making the material relatable and pandering to their lack of motivation (A. Brooks, personal communication, March 30, 2015).

A master teacher in the same department shared a week earlier, “This lack of motivation is bugging me, and I’ve got nothing left in my teacher toolkit except for some lint, cookie crumbs, and a moth. Any ideas?” (A. Washington, personal communication, March 26, 2015). Taking the time to determine what motivates a student to remain interested in learning science in the upper grade levels can help educators and districts create professional development sessions targeting motivational strategies. The need to identify the most influential psychosocial factors impacting a student could assist educators in creating factor-specific training that helps students retain interest within science.

Research shows there is a growing need to move away from a one size fits all mentality when it comes to educating our youth (Hall, Meyer, & Rose, 2012). Universal design for learning contends there is now a need to create classrooms where the idea of an average student is banned and differences are embraced (Hall et al.). In order to create an educational plan that addresses the needs of all learners within science, researchers need to determine if student perception of the classroom learning environment changes based on grade level. If grade level plays a role in student perceptions then grade level specific strategies should be embedded into daily teaching strategies and learning. Educators often adjust strategies and lessons based on achievement on an assessment; however looking at the psychosocial factors influencing learning could also add to the data teachers use to drive future instruction. For example, if it is determined that ninth grade students struggle with the self-regulatory practice of goal setting within a science classroom, then teachers could model goal-setting and have students practice creating goals throughout various units of instruction. Numerous districts within the State of Texas take this process one step further within English and math by using a statistical program called Inova Plus! to identify students who need support in the area of instruction and achievement (“Inova Plus!,” 2006). While achievement within math and English is not the focus of this research, the statistical program used to identify the struggling students is one reason the researcher became interested in the study of psychosocial learning factors.

The statistical software called Inova Plus! claims it takes what is called The Inova Process and combines it with the power of software to determine next steps on campuses to improve achievement within English and math (“Inova Plus!,” 2006). Inova Plus! promotes their program as a way for districts to identify target students through the use of scatterplots. Inova Plus! offers steps for interventions based on the scatterplots to assist campuses in their attempts to increase scores on the upcoming state assessments. Inova Plus! uses standard deviations on the scatterplot to determine the types of interventions that should be used by the teacher and campus. Interventions fall under two categories: psychosocial and instructional. According to Schultz and Martire (2006), an intervention refers to an action taken by the teacher to help a student increase achievement. In addition, psychosocial interventions are actions teachers take that target the physical, psychological, and social dimensions of student behavior in the hopes of increasing achievement on future assessments. Psychosocial interventions within Inova Plus! include contacting parents, encouraging letters to students, positive reinforcements, and monitoring of progress. Further analysis of the program shows interventions, psychosocial and instructional, are based solely on previous state assessment scores. Inova Plus! contends student scores who fall under the gold, blue, or gray areas on the standards deviation diagram are best helped through psychosocial instead of instructional interventions; the company has identified psychosocial interventions as giving a student a pat on the back and a phone call home (see Figure 1.1). Some students need instructional interventions only and some need both types of interventions in order to increase achievement.

Figure 1.1: Inova Plus! Scatterplot with Standard Deviations



The researcher's initial interest in this topic questioned why this program did not offer the same data in science and social studies. Students enrolled in public high schools in the State of Texas are required to pass the end-of-course biology and U.S. History assessments as part of the graduation requirement. As a result, why isn't longitudinal data pulled for these contents as well? The researcher assumes this is a difficult task for the program since the state assessments in these contents are not offered at every grade level. For example, students in science take a state assessment in 5th and 8th grade only; whereas, the math state assessment is taken every year between 3rd and 9th grade (TEA, 2011). Research to support the Inova Plus! claims was not found either on the company website or on district websites where the program is used. While psychosocial interventions look different than the psychosocial learning environment factors used in this study; the overall program and use of the interventions began the initial interest by the researcher into this topic of study.

Purpose of the Study

The purpose of this study was to identify 9th -12th grade student perceptions of psychosocial learning environment factors that contribute to motivation and self-regulation when learning science concepts. Interest in learning science is decreasing as students progress into the secondary years (Barmby, Kind, & Jones, 2008; Logan & Skamp, 2008; Vedder-Weiss & Fortus, 2011, 2012). As a result, schools need to implement strategies to increase student interest to learn science so that all students leave high school ready to enter society as scientifically literate citizens. Strategies within the science classroom cannot be implemented by teachers until student perceptions of the learning environment factors causing the decline are identified; therefore, the purpose of this research was to identify which psychosocial factors have the greatest impact on a student's perception of the classroom learning environment and how these perceptions might impact a student's self-regulation and motivation to learn science in a secondary classroom setting.

This study was based on a recommendation for future research to investigate the influence of student perceptions of the psychosocial learning environmental factors across secondary grade levels when learning science concepts. The initial findings of the Velayutham and Aldridge (2013) study proposed psychosocial learning environment factors significantly influenced student motivation and self-regulation practices to learn science across grades 8, 9, and 10 within Australia. While Velayutham and Aldridge (2013) found a positive correlation between the psychosocial learning factors, motivation, and self-regulation, their study analyzed all students together and therefore suggested a repeat of the study with an extension of analyzing the data by grade level. With this idea in mind, the researcher wondered if students enrolled in grades 9, 10, 11, and 12, within the United States, perceived the same psychosocial learning factors as important contributors to motivation and self-regulation when learning science. Would different psychosocial factors make a greater impact on a student's perceptions of the science classroom environment in the ninth grade versus a student in the tenth, eleventh or twelfth grade? For example, perhaps equity plays a greater role in motivation for a ninth grade student versus a tenth grade student. One goal of this study was to find the answer to this question.

Significance of the Study

Once students enter high school they typically spend over 8,000 hours learning science concepts each year (TEA, 2014). Tutorials attended before and after school increase this learning time, in addition to time spent studying at home. As a result, student perceptions of the classroom learning environment play a significant role in one's motivation and self-regulation when it comes to learning science (Fraser, Aldridge, & Adolphe, 2010).

According to Velayutham, Aldridge, and Fraser (2011), the more positive a student perceives their learning environment, the more motivated and self-regulated they will be to learn science concepts. Oftentimes, students within urban districts or students identified as at-risk are portrayed as apathetic towards learning new science concepts. In reality, these students lack the motivational ability to regulate their own learning due to psychosocial factors ("Inova Plus!," 2006). That is, there are two overarching factors that help students when learning science: academic factors and psychosocial factors. For the purpose of this study, psychosocial factors refer to factors that may help or interfere with the learning of science content. Examples of these types of factors include values, opinions, and personal orientations. Inova Plus! suggests all students need a balance between both factors before true learning can occur in a classroom ("Inova Plus!," 2006). A classroom with strong attributes of only one factor, academic or psychosocial, will inhibit motivation and self-regulation when students are attempting to learn the content. Although both are equally important, this research will focus on the psychosocial factors that contribute to learning. Psychosocial factors, for this study, include student cohesiveness, teacher support, student involvement and investigation, task orientation, cooperation, and equity in the classroom. If school districts can identify which factors are the most influential to a student when it comes to motivation and self-regulation then perhaps the district can create a plan of action that will help students decrease the apathetic behaviors. However, the question also arises, if it is found that certain factors are influential, are these factors the same at all secondary grade levels?

Walk into any high school science classroom and an observer can often “feel” the difference between classrooms filled with ninth grade students versus classrooms filled with senior level students. Some educators are adamant they do not have the skills needed to meet the psychosocial demands of ninth graders; whereas other educators claim the needs at each grade level are the same. The question then becomes, does grade level of a student really play a role in the psychosocial factors that lead to motivation and self-regulation when learning science? Previous research shows a decline in motivation to learn science as students move up in grade levels (Logan & Skamp, 2008; Swarat et al., 2012). This same research also contends motivation to learn science at the secondary levels is a strong predictor of future interests in science education and careers. If grade level does play an important role, then educators and school districts need to recognize this key component of learning and plan for the implementation of strategies that will help each student, regardless of grade level, reach success. The benefits of this study could offer guidance on embedding motivation and self-regulation strategies into lessons while at the same time ensuring students learn science concepts.

After extensive searching it has been noted by various studies there is minimal research that has been conducted studying the relationships between student perceptions of the science classroom learning environment, motivation, and self-regulation (Bandura, 1994; Schunk & Zimmerman, 2007; Velayutham & Aldridge, 2013; Velayutham et al., 2011). As a result, Veluytham, et al. (2011) developed a survey, Students' Adaptive Learning Engagement in Science (SALES), and administered it, along with the world-wide validated What Is Happening In This Class? survey, to identify which psychosocial learning factors had the greatest impact on science students' motivation and self-regulation within Australia. Quantitative and qualitative data was collected from over 1,000 students in grades 8 through 10 along with teacher feedback. Data analysis confirmed the psychosocial learning factors significantly influenced motivation and self-regulation in grades 8 through 10 when learning science concepts. More specifically, findings from the study suggest the psychosocial learning factors of student investigation, task orientation, and student cohesiveness had the greatest influence on a student's desire to learn science (Velayutham & Aldridge, 2013). Additional findings from the study revealed the psychosocial learning factor that had the greatest impact on a student's motivation and self-regulation to learn science was task-orientation (2013). The researchers suggested teachers could improve motivation and self-regulation in the science classroom merely by ensuring students understood the goals of each activity, by challenging students to complete their assigned tasks, and by setting clear expectations to complete a certain amount of work during class time (2013). Recommendations for future research included analyzing the relationships between the psychosocial learning factors, motivation, and self-regulation within a science classroom across various grade levels versus compiling all of the data together. This would give teachers the opportunity to determine if student perceptions of the psychosocial learning factors differed across grade levels when learning science.

Another problem facing districts is the need to create curriculum that addresses the whole learner (Carter, 2008). While it is essential for a student to learn science, students also need to strengthen their social and cultural skills. These skills can be acquired through science lessons that include hands-on activities, positive peer relationships, and opportunities for student growth (Carter, 2008; Verma, 2009). Schunk and Zimmerman (2007) suggest a student's social and cultural environments are important determinants of student behavior in addition to their learning in the classroom. As a result, it was the goal of this study to identify which psychosocial factors urban high school students face within a classroom that have the greatest impact, either positively or negatively, on motivation and the ability to self-regulate their learning. If certain psychosocial factors were identified as having negative impacts on motivation and self-regulation then plans could be created to help these factors become positive influences on learning. In addition, if certain psychosocial factors were identified as having positive impacts on motivation and self-regulation then plans could be created to ensure these factors are positive for all students.

Research Questions

The research questions and hypotheses for this study are as follows:

RQ1: Which psychosocial learning environment factors have the greatest influence on student motivation when learning science?

H_a: The psychosocial learning environment factors of investigation, task orientation, and student cohesiveness exhibit the greatest influence on student motivation when learning science.

H_o: The psychosocial learning environment factors of investigation, task orientation, and student cohesiveness do not exhibit the greatest influence on student motivation when learning science.

RQ2: Which psychosocial learning environment factors have the greatest impact on student self-regulation when learning science?

H_a: The psychosocial learning environment factors of investigation, task orientation, and student cohesiveness exhibit the greatest impact on student self-regulation when learning science.

H_o: The psychosocial learning environment factors of investigation, task orientation, and student cohesiveness do not exhibit the greatest impact on student self-regulation when learning science.

RQ3: Is there a relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant?

H_a: There is a relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant.

H_o: There is no relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant.

RQ4: Is there a significant difference in relationships between grade level and student perceptions of the psychosocial learning environment factors when learning science?

H_a: There is a significant difference in relationships between a grade level and student perceptions of the psychosocial learning environment factors when learning science.

H_o: There is no significant difference in relationships between a grade level and student perceptions of the psychosocial learning environment factors when learning science.

The following question was also explored since there was a significant difference in relationships between grade level and student perceptions of the psychosocial learning environment factors in a science classroom.

RQ5: How does the influence of psychosocial learning environment factors on motivation and self-regulation differ by grade level when learning science?

Definition of Terms

Equity: The extent to which all students in a science classroom are treated equally by the teacher (Waldrip, Fisher, & Dorman, 2009).

Motivation: A process that impacts how, what, and when a student learns science (Schunk, Pintrich, & Meece, 2008).

Psychosocial Learning Environment Factors: Student's perceptions of cohesiveness, cooperation, equity with peers, investigations, involvement, task orientation, and teacher support. It is the interrelationship between "teacher and student perceptions of school psychosocial climates and student cognitive, affective, and motivational outcomes" (Smith, 2013, p. 260).

Science Learning: The act of learning concepts in any science course.

Science Literacy: The awareness of the interrelationship between the environment, society, humans, science, and technology (Yuenyong & Narjaikaew, 2009).

Self-Regulation: Strategies students use to reach their salient goals. Positive emotions increase self-regulation and is influenced by student perceptions of their environment (Boekaerts & Cascallar, 2006).

Student cohesiveness: The extent to which a student knows, helps, and supports other students within a science classroom (Waldrip et al., 2009).

Student cooperation: The extent to which a student cooperates instead of competing with other students within a science classroom (Velayutham & Aldridge, 2013).

Student investigations: The extent to which students are interested in investigating and exploring science concepts (Brok, Fisher, & Koul, 2005).

Student involvement: The extent to which students participate in activities, discussions, assignments, and laboratory experiments within the science classroom (Waldrip et al., 2009).

Task Orientation: The extent to which students find it important to stay on task and complete science activities during class time. (Waldrip et al., 2009).

Teacher Support: The extent to which a science teacher helps, gains trust, and shows interest in his/her students (Aldridge, Fraser, Bell, & Dorman, 2012).

Conclusion

Science is everywhere; it is at work when we are awake and when we are asleep. Science never takes a break. As a result, it is essential that all citizens within this world become scientifically literate so that not only can the United States continue to lead the advancement of the STEM environment, but also to ensure that key societal issues and the economy continue to strengthen year after year. Unfortunately, the millennial generation is not only leaving high school with a decreased interest in science, the generation is also graduating lacking the skills in self-regulation (Nilson, 2013). While building a student’s self-esteem within a science classroom is important; strengthening accountability skills through daily expectations within a science classroom are essential as today’s public schools work to develop self-directed learners who are motivated to learn science. Failure to create self-directed learners within the science classroom is “professionally irresponsible and unethical” (Nilson, 2013). What follows is a thorough overview of research on the importance of creating self-regulated science learners, student perceptions of the science classroom learning environment, and motivational factors that contribute to interest in learning science concepts.

CHAPTER II

REVIEW OF THE LITERATURE

“If you truly want to engage kids, you have to pull back on control and create the conditions in which they can tap their own inner motivations” (Pink, 2012 p. 17).

The purpose of this study was to identify 9th – 12th grade student perceptions of psychosocial learning environment factors that contribute to motivation and self-regulation when learning science concepts. Interest in learning science is decreasing as students progress into the secondary years (Barmby et al., 2008; Logan & Skamp, 2008; Vedder-Weiss & Fortus, 2011, 2012). Identifying factors contributing to the decline could assist in determining next steps in professional development seeking to meet the needs of all students. This chapter focuses on current research related to self-regulation, the psychosocial learning factors that contribute to the science classroom learning environment, and motivation to learn science concepts in today’s high school classroom.

Theoretical Framework

Imagine walking into a science classroom where students are in control of their own learning; they regulate from within and make changes to their own thoughts or behaviors, when needed, to reach their goals (Nilson, 2013; Vassallo, 2013). This type of regulation is essential for every student in today’s science classroom and Barry Zimmerman (2001), a prominent self-regulation theorist, proposes a deep understanding and learning of any subject requires self-regulation. In addition, self-regulation requires motivation with the end goal of assisting students in recognizing that learning science concepts comes from within (Nilson, 2013; Schunk & Zimmerman, 1998; Vassallo, 2013; Zimmerman, 2001). A teacher can deliver the information; however, the desire and regulation to accept the knowledge is an "inside job" within each student.

> Learning is about one's relationship with oneself and one's ability to exert the effort, self-control, and critical self-assessment necessary to achieve the best possible results and about overcoming risk aversion, failure, distractions, and sheer laziness in pursuit of *real achievement*. This is self-regulated learning. (Nilson, 2013, p. xxvii).

Self-regulation is based on Albert Bandura's seminal work on self-efficacy (Bandura, 1994). Bandura suggested that children who exhibited self-efficacy skills also regulated their thoughts and behaviors (Bandura). As a result of these findings, Bandura began to work with teachers to offer direction on teaching self-regulated learning in schools. Although self-regulation is an intrinsic routine, it is something that can be taught in a science classroom and any student, regardless of age, ability, or intellect, has the ability to become an expert in self-regulated learning (Nilson, 2013; Schunk & Zimmerman, 1998).

Researchers contend there are two forms of thought on how self-regulated learning, or SRL, occurs within each individual (Vassallo, 2013). Sociocultural theorists view SRL as a specific event where individuals self-regulate when the contextual conditions are right. Constructivist theorists view SRL as a process whereby individuals use intrinsic and extrinsic information to construct their own goals and strategies. SRL can be seen as a skill that is acquired and strengthened through different experiences. Regardless of the side one takes on SRL, both agree it is a process that occurs through social forms of learning, such as seeking help from teachers, peers, parents, and administrators, in addition to personal forms of learning such as setting personal goals, searching for information, and completing tasks (Boekaerts & Cascallar, 2006; Velayutham & Aldridge, 2013). SRL can be seen as a form of empowerment for students as they seek to strengthen personal work skills within the science classroom. Teachers strive to increase a student's capacity to regulate their own learning through activities and lessons within the classroom (Boekaerts & Cascallar, 2006; Vassallo, 2013). As a child moves up in grade levels and increases in age, teachers find that a student's capacity to regulate their social and personal learning also increases (Boekaerts & Cascallar, 2006; Nilson, 2013; Vassallo, 2013). However, although a student's self-regulation increases with age, it also varies depending on the task and perceived purpose of learning the information; that is, self-regulation increases when the information learned has an immediate personal impact on the student (Lichtinger & Kaplan, 2011). For example, a ninth grade biology student learning about viruses like HIV might adopt a high level of self-regulation if a family member or friend is HIV positive; whereas, the same student could exhibit low self-regulation when learning about photosynthesis if the student does not have plants in the house.

Le and Wolfe (2013) suggest the best schools, classrooms, and teachers focus on developing their student's ability to self-regulate; particularly in areas where there is a high concentration of low-income students. These researchers also contend self-regulation is a teachable skill set students can easily strengthen through observing and emulating others. While research shows learning goal orientation, self-efficacy, and task value impact motivation; there is a gap in research identifying the influence of psychosocial factors within the classroom on motivation and self-regulation. As a result, Velayutham et al. (2011) created the Students' Adaptive Learning Engagement in Science (SALES) instrument targeting the motivational constructs and delivered it along with the What is Happening in This Class (WIHIC) to students within science classes to study the relationship between the psychosocial elements and learning goal orientation, self-efficacy, and task-value when learning science concepts. These researchers took their study a step further by analyzing the influence of these motivational components on self-regulatory practices when learning science.

Science Literacy

The goal of science education is to prepare the 21st century student for active participation in a democratic society (Verma, 2009). Focusing on science literacy in the classroom helps to equip students with the knowledge to make sound decisions when dealing with issues related to science and technology. As cited in Yuenyong and Narjaikaew (2009), Paul Hurd first used the term in 1958 then went on to offer a definition forty years later based on seven dimensions of a science literate person. Table 2.1 displays Paul Hurd's descriptions of the seven dimensions of a science literate person (1998).

Table 2.1

Paul Hurd's Seven Dimensions of a Science Literate Person (1998)

1. Understand the nature of scientific knowledge.
2. Apply appropriate science concepts, principles, laws, and theories in interacting with his universe.
3. Use the process of science in solving problems, making decisions, and furthering his own understanding of the universe.
4. Interact with values that underlie science.
5. Understand and appreciate the joint enterprises of science and technology and the interrelationship of these with each and with other aspects of society.
6. Extend science education throughout his or her life.
7. Develop numerous manipulative skills associated with science and technology.

Bybee (1997) suggested science literacy could be viewed as a "continuum of understanding about the natural and the designed world," moving through various stages from science illiteracy to multidimensional science literacy. Further research shows the term science literacy is often interchangeable with scientific literacy (Holbrook & Rannikmae, 2009; Feinstein, 2011; Liu, 2009; Yuenyong & Narjaikaew, 2009); however, Roberts (2007) argues there is a distinct difference between the two terms. Science literacy refers to *literacy with regard to science*; whereas scientific literacy refers to the *scientific nature of literacy* (Roberts, 2007). For the purpose of this study, the term science literacy will be used and will be defined as the awareness of the interrelationship between the environment, society, humans, science, and technology (Yuenyong & Narjaikaew, 2009).

While there is a big push for society to become science literate, Feinstein (2011) argues there is minimal empirical data to support this goal. That is, although scholars argue all students need to leave high school with some mastery of science to prepare for a successful life; little evidence has shown strong science literacy skills improve one's life. This researcher suggests there is little empirical data because studies have not been conducted; not because studies have failed to show the value of science literacy.

Classroom Learning Environment

The classroom learning environment, also called classroom climate, plays a significant role in student learning (Fraser et al., 2010; Logan & Skamp, 2008). That is, students learn better in a positive learning environment. Research on the classroom learning environment is based on Lewin's 1936 seminal work stating interactions with the environment often determine the behavior of an individual (Smith, 2013; Velayutham & Aldridge, 2013). Although Lewin's work was conducted in a non-educational setting, many researchers have used his work to investigate student behaviors within education (Afari, Aldridge, Fraser, & Khine, 2013; Fraser et al., 2010; Velayutham & Aldridge, 2013). Educational researchers have also used Moos' three dimensions of a human environment, which include relationships, personal growth, and system maintenance, to investigate classroom learning environments at various grade levels (Aldridge, Fraser, & Huang, 1999; Fraser, 1998; Fraser et al., 2010; Moos, 2007; Velayutham & Aldridge, 2013). The relationship dimension in a science classroom setting evaluates how much students are involved with one another and with the science learning environment. The personal growth dimension measures how a science learning environment impacts a student's opportunity to set goals, follow directions, and improve the self. The system management dimension measures how much the science learning environment is organized and has clear expectations. The What Is Happening In This Class? (WIHIC), one of the surveys used in this study, was developed using Moos' three dimensions to measure students' perceptions of the science classroom learning environment. Additional information regarding this survey's use of Moos' dimensions is provided in the instruments section of this study.

Velayutham and Aldridge (2013) identified seven psychosocial factors present in a learning environment that impact a student motivation to learn and their self-regulation practices. Student perceptions of the seven psychosocial characteristics of a classroom, which include student cohesiveness, cooperation, teacher support, equity, involvement, investigation, and task orientation, have been identified as key factors in determining student behavior and learning. What follows is a description of each psychosocial factor and how it relates to student learning.

Student cohesiveness

Cohesiveness refers to the strength of a student's desire to work with others in a class (Williams, Duray, & Reddy, 2006). For example, do students know and help each other? A study conducted by Aldridge, Fraser, Bell, & Dorman (2012) suggested although Australian students in grades 11 and 12 experienced cohesiveness within their classrooms, they preferred a more supportive classroom where there were stronger ties with peers. Williams, Duray, and Reddy contend motivation to learn can be dependent on cohesiveness; therefore, the stronger the cohesiveness the greater the motivation to learn science. A student who is motivated to help others in learning science is also most likely motivated to learn science themselves (Bryan et al., 2011; Gilbert et al., 2014; Schunk et al., 2008; Vedder-Weiss & Fortus, 2011; Velayutham et al., 2011). It is difficult to help others if you are not motivated to learn the topic yourself. Strong cohesiveness with others in the class could also hinder motivation to learn science (Velayutham & Aldridge, 2013). For example, if a student has strong cohesive ties with others in class who do not like to learn science, then they could succumb to peer pressure and turn away from learning. As a result, cohesiveness can increase energy, either positively or negatively, in a classroom.

Cooperation

Cooperation refers to working with peers to learn a task versus competing against others in a classroom. Collaborative learning is an example of cooperation where students work together to solve problems and learn new ideas (Domalewska, 2014; Garcia-Valcarcel, Basilotta & Lopez, 2014). It allows students to look at a learning opportunity from a different point-of-view. Cooperation with others not only supports learning; it also gives students the opportunity to build social skills within a safe environment (Domalewska, 2014). Cooperative learning is another example where students engage in group discussions about science content to promote learning. This type of learning not only turns the center of attention onto the students, it also promotes a more positive social and motivational environment within the science classroom (Garcia-Valcarcel, Basilotta & Lopez, 2014; Stevens, 2008). Research shows students need direct guidance on how to collaborate and cooperate with others in class; doing so increases a student’s ability to interact with their peers within the science classroom (Stevens, 2008).

Teacher support

A student's perception of teacher support, including trust and interest, is an additional psychosocial factor identified as a determinant of a student motivation to learn a concept. Liaghatdar, Soltani, and Abedi (2011) found teacher support plays a critical role in student attitudes towards learning science. Additionally, research supports the idea that students need to feel valued and equal in the teacher's eyes in order for learning to occur (Fraser et al., 2010; Smith, 2013). Previous studies show teachers strengthen student motivation to learn science by offering rationales for learning, a willingness to help, when they acknowledge student perspectives, and when options for student autonomy are available within the classroom (Gilbert et al., 2014; Maltese & H.Tai, 2010). As a result, teachers have the ability to turn students onto and off from learning science through student perceptions of teacher attitude and teacher-student interactions (Logan & Skamp, 2008; Maltese & H.Tai, 2010; Vedder-Weiss & Fortus, 2011, 2012).

Equity

Fair treatment of all students is an additional psychosocial factor that contributes to a student's motivation to learn science concepts. This is not to say that all students are required to complete the same tasks; instead, students need to feel like they have equal access to learning (Aldridge, Fraser, Bell, & Dorman, 2012; Bell & Aldridge, 2014). What this looks like for one student may look different for another student based on their learning needs. DiMartino and Miles suggest "educational equity creates a culture of fairness for all students regarding opportunity, access, and respect for diverse learning styles" (p. 45). Students who feel like the teacher gives preferential treatment to certain students in the classroom tend to exhibit lower motivation to complete tasks. Students in the Bell and Aldridge (2014) study shared equity was important within the classroom learning environment. Science students want the same opportunity to answer questions as other students in the classroom. They want to receive the same encouragement from the teacher as other students do and they want to contribute to class discussions.

Student involvement

The involvement factor refers to a student's interest, enjoyment, and active participation in when learning science. Aschbacher et al., (2013) contend involvement decreases as a student increases in age due to a lack of encouragement and relevant learning opportunities within the classroom. Student involvement occurs when students are given the opportunity to share their ideas and opinions in class (Aldridge et al., 2012; Bell & Aldridge, 2014; Velayutham & Aldridge, 2013). It occurs when student suggestions are used during classroom discussions and when students are able to explain how they solved a problem within science. For example, student involvement occurs when a teacher has students share how they solved a stoichiometric problem within a chemistry classroom. A study conducted by Bell and Aldridge (2014) shared students felt opportunities for involvement seldom occurred; yet they perceived this as an important factor when it came to learning difficult concepts.

Task orientation

The task orientation factor describes student perceptions of the importance of completing planned science activities and remaining focused on daily lessons. Task orientation also refers to knowledge of classroom expectations along with creating meaningful goals either for the day or for the unit. Teachers can assist in improving student perceptions of the classroom learning environment in science by modeling goal-setting, offering frequent feedback, and by setting clear classroom expectations (Lemov, 2010; Osguthorpe & Osguthorpe, 2009). In addition, students who maximize their time-on-task and find value in completing the assignments will have a more favorable view of the classroom learning environment (Aldridge et al., 2012; Bell & Aldridge, 2014). Research conducted by Bell and Aldridge (2014) gave students the opportunity to share what they perceived was occurring within the learning environment versus what they preferred in a learning environment. Within this study, students stated knowledge of the classroom expectations, goal-setting, the ability to remain focused on the assigned lessons, and finding value in completing the daily lessons was important within the learning environment (Aldridge et al., 2012; Bell & Aldridge, 2014).

Student investigation

The final psychosocial learning factor identified as a key determinant in student motivation relates to student perceptions of investigations. This factor describes the perceptions of classroom opportunities to problem solve or investigate an issue. In Texas, the requirements for every science course at the high school level specifically states two key things and that is all students will conduct laboratory and field investigations in the science classrooms and for at least 40% of instructional time, the students will conduct laboratory and field investigations (Tex. Educ. Code, 2010). While the 40% rule is a state requirement, research suggests investigations are lacking in the classroom and instead teachers are focusing on covering content (Aldridge et al., 2012; Bell & Aldridge, 2013). A classroom that lacks student-centered investigations inhibits growth of a student's problem-solving skills (Logan & Skamp, 2008). Offering increased opportunities to perform investigations and to explain results from the investigations promotes motivation and self-regulation in the science classroom (Velayutham and Aldridge, 2013).

While it has been suggested the psychosocial learning factors all determine a student's efficacy and ultimately achievement within a content area; researchers have conducted numerous studies to determine if one specific psychosocial learning factor plays a more critical role in student learning (Dorman, Fisher, & Waldrip, 2006; B. Johnson & Stevens, 2006; Kim & Lorsbach, 2005). For example, does a ninth grade student find more value in student cohesiveness when learning content versus a twelfth grade student who perhaps finds more value in teacher support? In addition, researchers have determined that student motivation and self-regulation are also impacted by the psychosocial learning factors (Bandura, 1994; Schunk & Zimmerman, 2007).

Student Motivation

Motivation, in basic terms, is something that moves a student forward either to reach a goal or to complete a task; it is what drives a student to turn the page (Schunk et al., 2008). Motivation leads to learning which influences a student's desire to learn more (Aschbacher et al., 2013). Motivation is comprised of both intrapersonal and interpersonal processes (Reeve & Jang, 2006; Schunk et al., 2008). Intrapersonal motivation occurs from within; it is dependent on the self and one's personal beliefs. In this study student investigations, task orientation, task value, self-efficacy, and learning goal orientation are intrapersonal motivational processes. Interpersonal motivation is dependent on others like one's peers and teachers. It is dependent on the relationship with others. In this study, involvement, cooperation, equity, teacher support, and cohesiveness are interpersonal motivational processes.

Motivation, which is essential for learning content, also plays a critical role in self-regulation (Le & Wolfe, 2013; Lichtinger & Kaplan, 2011; Schunk et al., 2008;

Zimmerman, 2008). “Motivated students enjoy learning science, believe in their ability to learn, and take responsibility for their learning” (Bryan, Glynn, & Kittleson, 2011, p. 1050). Motivation is a multi-component construct and research suggests the more students are motivated through increased self-efficacy, perception of task value, and learning goal orientation, the greater their self-regulation will be when it comes to learning science concepts (Bryan et al., 2011; Dorman et al., 2006; Velayutham et al., 2011; Velayutham & Aldridge, 2013). Students who are motivated in class are more likely to ask questions and advice in addition to participating more in class activities. Research also suggests students who are motivated within a science classroom are more likely to think critically and to improve their academic achievements (Velayutham et al., 2011; Velayutham & Aldridge, 2013). That is, the more motivated a student becomes, the more ownership a student will take in learning science; on the other hand, a student with low self-efficacy, low perception of task value, and/or low learning goal orientation will lead to a decrease in self-regulation (Dorman et al., 2006; Liaghatdar et al., 2011; Zimmerman, 2008).

Learning Goal Orientation

Achievement goal theory is one of many theories that seek to explain student motivation within a learning environment (Lichtinger & Kaplan, 2011; Schunk et al., 2008; Velayutham & Aldridge, 2013). Lichtinger and Kaplan (2011) contend the achievement goal theory plays a critical role in identifying underlying factors impacting motivation and self-regulation. This theory looks at two types of goal orientation, learning and performance, to analyze the reasoning behind motivation and engagement within a student behavior (Lichtinger & Kaplan, 2011; Schunk et al., 2008). Learning goal orientation refers to developing content knowledge to show competence, strengthening skills, and to master a task. "I work hard to learn," and "Understanding science ideas are important to me," are examples of learning goal orientation statements one might find on a survey instrument. Performance goal orientation focuses on demonstrating competence so as to appear intelligent; the end product or how one is judged is the focus of performance goal orientation. "I work hard to get a high grade," and "I really don't like to make mistakes" are examples of statements researchers might use to measure performance goal orientation. While these two goals are essential in reaching achievement, researchers argue learning goal orientation overrides performance goal orientation when looking specifically at self-regulation and motivation (Lichtinger & Kaplan, 2011; Schunk et al., 2008). That is, the idea of learning and mastering content makes a greater impact on self-regulation versus the idea of demonstrating high-ability or achievement.

Self-Efficacy

According to Bandura (1994), "perceived self-efficacy" is defined as one's belief in their ability to perform at a certain level. The higher the perceived self-efficacy, the stronger one's belief is in accomplishing a specific goal. Students who exhibit confidence in their abilities are more motivated to tackle difficult science concepts, remain focused on a task longer, and regulate their own learning (Usher & Pajares, 2008; Velayutham & Aldridge, 2013). In contrast, low perceived self-efficacy often leads to low aspirations, off-task behaviors, and high stress levels.

Task Value

Task value refers to the value a student places on a science activity. The higher the task value, the more motivated the student will be to complete the activity (Schunk & Zimmerman, 2007). The more motivated a student is to complete the activity, the more likely the student will self-direct their learning practices (Schunk & Zimmerman, 2007; Velayutham & Aldridge, 2013). Findings from the Velayutham & Aldridge (2013) study suggest teacher support plays a significant role in helping students understand the value of a task when learning science concepts. Students will be able to tell if the teacher finds value in the assigned tasks and they will often mimic what the teacher is feeling (Schunk & Zimmerman, 2007; Velayutham & Aldridge, 2013).

Self-Regulation

Self-regulation, within a high school science classroom, refers to one's ability to direct and control motivation and behavior towards learning science concepts (Velayutham & Aldridge, 2013). While research in the area of psychosocial learning factors, motivation, and self-regulation is minimal, the development of a new instrument Students' Adaptive Learning Engagement in Science (SALES) by Velayutham and Aldridge (2011) in conjunction with the use of the What Is Happening In This Class (WIHIC) instrument has given researchers the opportunity to explore these three constructs together within the science classroom. Research conducted by Velayutham and Aldridge (2013) found Australian students in grades 8, 9, and 10 who participated in student investigations were more likely to regulate their learning within a science classroom. This study also revealed an increase in student self-regulation in classrooms where clear expectations, goals for each activity, and teacher encouragement to remain on task were evident. Velayutham and Aldrige (2013) further argued student cohesiveness was critical to the self-regulation and motivation of Australian students in grades 8, 9, and 10 when learning science concepts. These researchers stated the need to develop positive social bonds during these grade levels would assist in increasing self-regulation within the science classroom.

Texas School Report Card

Texas accountability ratings for schools are based on four performance indexes: student achievement, student progress, closing performance gaps, and postsecondary readiness. There is a target score each campus is required to meet or exceed in order to earn a Met Standard accountability rating for the year. Schools that fail to meet or exceed the target score earn an Improvement Required accountability rating for the year. Multiple factors contribute to a campus score under each performance index to determine the overall score. Graduation plans, either the foundation plan or graduating with endorsements, fall under the postsecondary readiness performance index. Schools with high numbers of students graduating under the foundation plan earn fewer points than schools that have high numbers of students graduating with endorsements. For this reason, many schools require students to follow an endorsement plan, which includes earning credit in a minimum of four science courses. The student achievement, student progress, and closing performance gaps are based on factors such as daily attendance and scores on state assessments; which campuses sometimes have little control over. However, campuses do have control over which plan a student graduates under and therefore most schools required students to graduate with an endorsement.

Science Courses

Students have the option of taking Biology I or pre-AP Biology I their freshman year. This course is a requirement for graduation and students must also pass the Texas End-of-Course Biology State Assessment as an additional requirement for graduation (TEA, 2014). Students at this grade level are typically new to campus since 9^{th} grade is the first grade taught on a high school campus. Transition from middle to high school is typically met with increased freedom and behavior issues along with decreased achievement and motivation to learn (Dorman, 2012; Habeeb, 2013). As a result, 9^{th} grade science classrooms are typically nurturing environments that help students develop skills they will use on their own as they grow older (Habeeb, 2013).

Most students enroll in Chemistry I or pre-AP Chemistry I for their sophomore year unless they are ESL, which means they are struggling with the English language or unless they are identified as special needs. Students in these two categories enroll in Integrated Physics and Chemistry, which is a sophomore course that covers the basics of both chemistry and physics but at a slower pace than Chemistry I and Physics I. Students in these courses should typically participate in more laboratory investigations based on the state objectives; however, teachers are beginning to expect more self-motivation and regulation from the students at this grade level (Assistant Principal, personal communication, July 29, 2015).

Junior level students choose between Physics I and AP Physics I. These students may also choose to enroll in an AP Biology, AP Chemistry, or AP Environmental Science course if they are interested in taking an additional science course during their junior year. Some students will choose this route if they are following the STEM endorsement plan. Students at this level also begin applying for college and teachers begin preparing students for college-level work by increasing expectations in the classroom.

Once seniors earn credits in biology, chemistry, and physics, they now have the opportunity to choose an elective science course or multiple elective science courses if there is room in their schedule (TEA, 2014). At this point, students are given the freedom to select a course that is interesting instead of mandated by the school district or State of Texas (Counselor, personal communication, July 29, 2015). These courses are typically rigorous and highly engaging as the teachers prepare students to either enter college courses or the work-force. Students choose from the elective courses in Table 2.2 based on their interest in science.

Table 2.2: Senior Elective Science Course Descriptions

Senior Course	Description
Anatomy and Physiology………………..	Study of the human body.
Honors Anatomy and Physiology……….	Study of the human body in a rigorous lab setting.
AP Biology II…………………………..	A rigorous second-year course in biology that prepares students to successfully complete the AP Biology II examination.
AP Chemistry II………………………..	A rigorous second-year course in chemistry that prepares students to successfully complete the AP Chemistry II examination.
AP Environmental Science…………….	A rigorous course over the study of the environment and its impact on society. This course prepares students to successfully complete the AP Environmental Science examination.
Aquatic Science……………………….	Study of aquatic life, both abiotic and biotic.
Astronomy…………………………….	Study of the universe.
Engineering Your World……………...	Hands-on engineering course where students create working models based on science concepts.
Earth and Space Science………………	Study of the Earth and Universe.
Environmental Systems……………….	Study of the environment and its impact on our daily lives.
Forensic……………………………….	Study of the science behind criminal investigations.

While the State of Texas currently states students are required to take Biology I and two-three other science courses, depending on their graduation plan; most districts require students to take Biology I, Chemistry I, Physics I, and an elective; that is, some campuses and districts do not allow students to choose two-three electives in place of Chemistry I and Physics I (TEA, 2014). The prerequisites for each course give the districts the freedom to impose these requirements (Texas House Bill 5, 2013). According to the campuses, students who are not necessarily interested in chemistry and physics are still required to take the courses so as to prepare them for similar courses at the university level.

Conclusion

Self-regulation is an essential ingredient in the recipe for success in life and in the workplace (Nilson, 2013; Schunk et al., 2008; Schunk & Zimmerman, 1998; Vassallo, 2013; Zimmerman, 2001). Self-regulation skills within a science classroom can be embedded into the curriculum and strengthened each year, regardless of the age, ability, or intelligence of the child. Self-regulation is linked to motivation, self-efficacy, learning goal orientation, and task value within a science classroom. In addition, classroom learning environments also contribute to interest in learning science. While research shows learning goal orientation, self-efficacy, and task value impact motivation; there is a gap in research identifying the influence of psychosocial factors within the science classroom on motivation and self-regulation. As a result, Velayutham et al. (2011) created the SALES instrument targeting the motivational constructs and administered it, along with the WIHIC, to students within science classes to study the relationship between the psychosocial elements and learning goal orientation, self-efficacy, and task-value when learning science concepts. These researchers took their study a step further by analyzing the influence of these psychosocial components on self-regulatory practices when learning science. The focus of the next chapter will be on the use of the SALES and WIHIC instruments in an urban high school with the addition of grade level as another factor in order to help in closing this gap in research.

CHAPTER III

METHODOLOGY

The purpose of this study was to identify 9^{th} – 12^{th} grade student perceptions of psychosocial learning environment factors that contribute to motivation and self-regulation when learning science concepts. Archival survey data collected from a purposive sampling of high school students enrolled in science courses in a large urban school district in southeast Texas was used for this study. This chapter will present an overview of the population and sample, operational definitions, research design, instrumentation, research and data collection procedures, data analysis procedures, ethical issues and limitations to the study.

Population and Sample

An urban high school located in southeast Texas was used for this study. The school district has 45,567 students; 12,150 of those students attend one of the three comprehensive high schools, and 90% participate in free or reduced meals program (TEA, 2013). There were 3,723 freshman, 3,263 sophomores, 2,860 juniors, and 2,304 seniors attending the three high schools with 52% being male and 48% being female. The district was comprised of 33% African Americans, 50% Hispanic, 4% White, 12% Asian, and 1% other (TEA, 2013). Table 3.1 shows the demographics for this district. High school students within this district are typically between the ages of fourteen and nineteen. The instruments were administered to a convenience sample of students who had a signed waiver on file and who were enrolled in a science course, regardless of ability, gender, race, and/or socioeconomic status.

Table 3.1

District Demographics

Demographic	Number of Students	Percentage
Grade 9	3,723	30.6
Grade 10	3,263	26.9
Grade 11	2,860	23.5
Grade 12	2,304	19.0
African American	3,985	32.8
Hispanic	6,038	49.7
Asian	1,543	12.7
White	461	3.8
Other	133	1.1

The sample consisted of 522 participants, approximately half of them were female (n = 267), while the rest were male (n = 255). Table 3.2 shows the campus demographics and Table 3.3 shows the number of students and percentages of participants in this study across grades 9-12.

Table 3.2

Campus Demographics

Demographic	Number of Students	Percentage
Grade 9	983	32.0
Grade 10	779	25.4
Grade 11	692	22.6
Grade 12	614	20.0
Male	1619	52.8
Female	1449	47.2
African American	1063	34.7
Hispanic	1419	46.3
Asian	371	12.1
White	85	2.8
Other	130	5.2

Table 3.3

Number of Students and Percentages of Participants by Grade Level

Grade	Number of Students	Percentage
9	96	18.4
10	156	29.9
11	103	19.7
12	167	32.0

All ninth grade participants were sitting in either Biology I or pre-AP Biology I. Tenth grade through twelfth grade participants were mixed into the remaining science courses. While Chemistry I and pre-AP Chemistry I are typically tenth grade courses, students can take either course as an eleventh or twelfth grader, if necessary. The same rule applies to Physics I and pre-AP Physics I. For example, a student who might be working to graduate a year early may be coded as a twelfth grader due to credits but may only be a third-year student who is sitting in a pre-AP Physics I course. Another example might be an eleventh grader who is repeating the second semester of Chemistry I if they did not earn credit the previous year; however, they may have earned enough credits to be coded as an eleventh grader so they are still on track to graduate with their cohort. As a result, while a majority of the chemistry students who participated in the survey were tenth graders, a few were eleventh and twelfth graders. A majority of physics students who participated in the survey were eleventh graders, a few were tenth and twelfth graders. Senior-level students in AP Biology II, Aquatic Science, Astronomy, and Earth/Space Science also participated in the study. There were no tenth or eleventh grade students in the senior-level courses.

Table 3.4 reports the numbers and percentages for ethnicity for those who participated in the study. Fifty-one percent of the participants were Hispanic, 33% African American, 12% Asian, 3% White, and 1% Native American/Pacific Islander. Table 3.5 shows the frequencies and percentages of participants identified as At-Risk, Economically Disadvantaged (ECD), Limited English Proficient (LEP), Gifted/Talented (GT), English as a Second Language (ESL), Special Needs (SPED), and Dyslexic (DYS).

Table 3.4

Numbers and Percentages of Participants by Ethnicities

Ethnicity	Number of Students	Percentage
Hispanic/Latino	265	50.8
African American/Black	171	32.8
Asian	64	12.3
White	15	2.9
Native American/Pacific Islander	3	0.6

Table 3.5

Demographic Numbers and Percentages of Participants

Demographic	Number of Students	Percentage
At Risk	275	52.7
ECD	398	76.2
LEP	63	12.1
GT	37	7.1
ESL	35	6.7
SPED	6	1.1
DYS	13	2.5

Operational Definitions

This study included two criterion variables and eight predictor variables for research questions one through three. Motivation was considered a criterion variable in this study since it is dependent on each of the eight predictor variables. The relationship between student perceptions of the psychosocial learning environment factors and self-regulation within a science classroom was measured in research question three while holding motivation constant. Grade level, student cohesiveness, teacher support, task orientation, student investigation, equity, student cooperation, and student involvement were predictor variables in this study. Self-regulation was considered a criterion variable for research questions two and three. Research question four had one factor (grade level) and seven dependent variables (student cohesiveness, teacher support, task orientation, student investigation, equity, student cooperation, and student involvement). The number of predictor variables for research question five was dependent on how variables many showed significance in research question four.

A science student is referred to anyone classified as a high school student who is was enrolled in a science course on the campus including anatomy/physiology, aquatic science, biology, chemistry, environmental systems, forensics, physics, AP Biology and AP Chemistry, AP Environmental Science. Any student taking an online version of a science course was not included in this study.

Research Design

This non-experimental quantitative study analyzed archival data to examine the relationship between student's psychosocial learning environmental factors and their motivation/self-regulation when learning science concepts. The relationship between grade level, psychosocial learning factors, motivation, and self-regulation was also explored. Variables were not manipulated in this study; the design allowed the researcher to analyze what has already occurred in the previous year to look for patterns and possible correlations (Johnson & Christensen, 2008).

Instrumentation

The What Is Happening In This Class (WIHIC) instrument measures student perceptions of the science classroom based on Moos' three dimensions of relationships, personal growth, and system management (Aldridge, Fraser, & Huang, 1999). There are seven subscales with eight statements per subscale and each item uses a 5-point Likert scale: A = *almost never*, B = *seldom*, C = *sometimes*, D = *often*, and E = *almost always* (See Appendix C). The subscales are student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity. Student cohesiveness, teacher support, and involvement measure Moos' relationship dimension of the human environment; student investigation, task orientation, and cooperation measure the personal growth dimension; and the equity subscale measures the system maintenance dimension of the learning environment. The instrument has an established validity across numerous countries including the United States, Turkey, Korea, and India and is the most widely used survey in this type of study (Fraser et al., 2010). Numerous studies show the Cronbach alpha reliability coefficient ranges between 0.82 and 0.92 (2010). Table 3.6 shows the comparison between the Cronbach's alpha coefficients for the WIHIC in this study and the reliability coefficients reported by Aldridge (1999).

Table 3.6

Cronbach's Alpha Reliability Coefficients for the WIHIC

	Cronbach's Alpha (α) Blanco (2015)	Cronbach's Alpha (α) Aldridge (1999)
Student Cohesiveness	.88	.81
Teacher Support	.94	.88
Student Involvement	.93	.84
Student Investigation	.95	.88
Task Orientation	.90	.88
Cooperation	.92	.89
Equity	.94	.93

What follows is a description of each construct that is measured using the WIHIC instrument:

Student Cohesiveness. These statements contain items concerning student perceptions of cohesiveness with other students in the science classroom.

Teacher Support. The statements in this subscale request student responses regarding their perceptions of teacher support in the science classroom.

Student Involvement. This subscale measures perceptions of student involvement in the science classroom.

Student Investigation. Subscale statements for this section measure perceptions of student investigations that occur within a science classroom.

Task Orientation. Student perceptions of the importance of staying on task and completing activities within the science classroom are measured using this subscale.

Cooperation. Student perceptions of cooperation with others in a science classroom are measured using this subscale.

Equity. Student perceptions of equal treatment of all students by the science teacher are measured using this subscale.

Table 3.7

What Is Happening In This Class Sample Statements

Psychosocial Factor…….	Example of a statement
Student investigation……..	I am asked to think about the evidence for statements.
Student involvement……..	I discuss ideas in class.
Task orientation……..	I pay attention during this class.
Teacher support……..	The teacher takes a personal interest in me.
Equity……..	I get the same amount of help from the teacher as do other students.
Cooperation……..	I cooperate with other students when doing assignment work.
Student cohesiveness……..	I make friendships among students in this class.

The Students' Adaptive Learning Engagement in Science (SALES), developed by Velayutham et al. 2011, is used to measure students' attitudes and self-regulation in science. The instrument is comprised of 32 5-point Likert scale items across 4 subscales: A = *strongly disagree*, B = *disagree*, C = *not sure*, D = *agree*, and E = *strongly agree* (See Appendix B). The value of the alpha reliability coefficient, in previous research, for each subscale is 0.9 or above (Velayutham et al., 2011). Table 3.8 shows the comparison between the Cronbach's alpha coefficients for the SALES in this study and the reliability coefficients reported by Velayutham et al (2011).

Table 3.8

Cronbach's Alpha Reliability Coefficients for the SALES

	Cronbach's Alpha (α) Blanco (2015)	Cronbach's Alpha (α) Velayutham et al (2011)
Learning goal orientation	.92	.91
Task value	.91	.92
Self-efficacy	.90	.92
Self-regulation	.90	.91

The three constructs that collectively measure a student's motivation when learning science include learning goal orientation, task value, and self-efficacy. What follows is a description of each construct that is measured using the SALES instrument:

Learning Goal Orientation. Refers to developing content knowledge to show competence, strengthening skills, and to master a task.

Task Value. This subscale measures student's view of the level of importance of a task or assignment within the science classroom.

Self-Efficacy. A student's belief in themselves, within a science classroom, can be measured using self-efficacy.

Self-Regulation. A student's ability to self-regulate their behaviors and actions within a science classroom are measured using this subscale.

Table 3.9

Students' Adaptive Learning Engagement in Science Sample Statements

Subscales	Example of a statement
Learning goal orientation……..	One of my goals is to learn as much as I can.
Task value……..	What I learn can be used in my daily life.
Self-efficacy……..	I am good at this subject.
Self-regulation……..	I concentrate in class.

Research/Data Collection Procedures

Archival data from two surveys administered to 522 students enrolled in science courses at an urban high school in southeast Texas was used for this study. Student participation in the survey was voluntary and administered to students who completed and returned the school district's Parent-Student Acknowledgement/Consent Form in September 2014 (see Appendix A). Parent and student signatures were both obtained on the district form allowing the student to participate in surveys administered by district employees. Student names, teacher names, courses, campuses, and the district name were not identified in this study. Archival data did not contain any identifiers related to the student, teacher, course, campus, or district.

The WIHIC and SALES instruments were administered to a purposive sampling of students meeting the criteria above during the last month of the 2013-2014 academic year. Prior approval for collection of the data was received based on the science district coordinator's desire to identify ways to improve student performance and interest in science with the district. The coordinator gave the researcher permission to use the archival data to further analyze student perceptions of learning within the science classrooms. District IRB approval was obtained prior to administering the surveys. The researcher obtained CPHS approval from the university prior to analyzing the archival data. The researcher received a flash drive of archival data, in the form of an Excel file, from the district once university CPHS approval was received. The results of the study was shared with the participating district once the study was completed.

Data Analysis Procedures

Statistical Package for the Social Sciences (SPSS) was used to conduct multiple linear regression, multivariate analysis-of-variance, and bivariate linear regression analysis. Data from the surveys was entered into MS Excel and then imported into SPSS. Missing survey data was removed prior to running the analyses. A significance value of .05 was utilized for research questions 1, 2, 3, and 5. A significance value of .01 was used for research question 4.

The following research questions guided this study:

RQ 1. Which psychosocial learning environment factors have the greatest influence on student motivation when learning science?

RQ 2. Which psychosocial learning environment factors have the greatest impact on student self-regulation when learning science?

RQ 3. Is there a relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant?

RQ 4. Is there a significant difference in relationships between grade level and student perceptions of the psychosocial learning environment factors in the science classroom?

RQ 5: How does the influence of psychosocial learning environment factors on motivation and self-regulation differ by grade level when learning science?

Research questions 1 (RQ1), 2 (RQ2), and 3 (RQ3) were addressed using multiple linear regression analysis. This type of analysis allows the researcher to assess the relationship between multiple predictor variables and a criterion variable. For RQ1, a multiple linear regression analysis was used to determine how well the psychosocial learning factors predicted motivation when learning science at the high school level. The same analysis was used in RQ2; however, the focus was on self-regulation instead of motivation. That is, how well did the psychosocial learning factors predict self-regulation when learning science at the high school level? For RQ3, a multiple linear regression with two ordered sets of predictors was used to predict the relationship between the psychosocial learning factors and self-regulation while holding motivation constant. Research question 4 (RQ4) was analyzed using multivariate analysis-of-variance (MANOVA). This type of analysis offers the researcher the opportunity to evaluate whether the population means on a set of dependent variables vary across levels of a factor. Therefore, do the different psychosocial learning factors differ in significance at the different grade levels? For example, is one psychosocial learning factor significant at one grade level and not significant at another grade level? Research question 5 (RQ5) was addressed using multiple linear regression analysis for the dependent variables that showed significance in RQ4. The files were split by grade level in SPSS and then a multiple linear regression analysis was used to determine how well the significant psychosocial learning factors from RQ4 predicted motivation at each grade level when learning science at the high school level. The process was repeated using self-regulation as the criterion variable with the same significant predictor variables from RQ4. Results of each test are discussed in Chapter IV.

Conclusion

The purpose of this study was to identify which psychosocial learning environment factors 9th – 12th grade students perceived as the most influential in a high school science classroom. Multiple regression analysis and multivariate analysis of variance of archival data obtained from an urban school district was used to identify any relationships between the student perceptions of psychosocial learning factors, grade level, motivation, and self-regulation. It is the goal of the researcher to create future professional development sessions based on the results from this data so that teachers and district personnel can design lessons targeting student needs within all high school science classrooms. Chapter IV will discuss the results from each of the tests conducted to answer the five research questions.

CHAPTER IV

RESULTS

The purpose of this study was to identify 9^{th} -12^{th} grade student perceptions of psychosocial learning environment factors that contributed to motivation and self-regulation when learning science concepts. The focus of this chapter is to present the quantitative results for each question that guided this study. Analysis and implications for each question are further discussed in Chapter V.

Finding from the Research Questions

Multiple regression analysis was used to identify any relationship between psychosocial learning factors, grade level, motivation, and self-regulation. Multivariate analysis-of-variance was also used to evaluate if the psychosocial learning factors varied in significance across grade levels. The psychosocial learning factors that showed significance across grade levels were additionally assessed using bivariate linear regression analysis. Data from the surveys was entered into MS Excel and then imported into the Statistical Package for the Social Sciences (SPSS). Table 4.1 presents the means and standard deviations of the variables in this study.

Table 4.1

Means and Standard Deviations for Psychosocial Learning Environment Factors, Motivation, and Self-Regulation

Variable	Mean	Standard Deviation
Student Cohesiveness	3.70	.87
Teacher Support	3.50	1.02
Student Involvement	3.09	1.01
Student Investigation	3.04	1.07
Task Orientation	3.84	.81
Cooperation	3.58	.93
Equity	3.77	.97
Self-Regulation	3.52	.82
Motivation	90.83	16.65

Research Question 1

Research question one, *Which psychosocial learning environment factors have the greatest influence on student motivation when learning science?*, evaluated how well psychosocial learning factors predicted motivation when learning science at the high school level through the use of multiple linear regression analysis. The predictors were the seven psychosocial learning factors (student cohesiveness, teacher support, student involvement, student investigation, task orientation, cooperation, and equity), while the criterion variable was motivation. The linear combination of the psychosocial learning factors was significantly related to motivation, $F(7, 513) = 51.89$, $p < .001$. The sample multiple correlation was .64, indicating that approximately 41% of the variance in motivation can be accounted for by the linear combination of psychosocial learning factors.

The following equation, based on the unstandarized coefficients, was used to explore the relationship between the criterion variable, motivation (*Motiv'*), and the predictor variables, student cohesiveness (*StCoh*), task orientation (*TaOri*), cooperation (*Coop*), equity (*Equ*), teacher support (*TSup*), student involvement (*StInvol*), and student investigation (*StInves*).

$$Motiv' = .26\ StCoh + 1.14\ TaOri + .03\ Coop + .09\ Equ + .26\ TSup - .18\ StInvol + .24\ StInves + 36.10$$

Table 4.2 presents the indices to indicate the relative strength of the individual predictors. All of the bivariate correlations between the psychosocial learning factors and motivation were positive and four of the seven indices were statistically significant ($p < .05$). Only the partial correlation between the psychosocial learning factor of task orientation and the motivation index was significant. For every one point increase on the scale for task orientation, motivation to learn science increases by 1.14. On the basis of these correlational analyses, it is tempting to conclude that the only useful predictor is the psychosocial learning factor of task orientation. It alone accounted for 37% (.609 = .37) of the variance of the motivation index, while the other variables only contributed between 14% and 25%. However, judgments about the relative importance of these predictors are difficult because they are correlated.

Table 4.2

The Bivariate and Partial Correlations of the Predictors with Motivation Index

Predictors	Correlation between each predictor and the motivation index	Correlation between each predictor and the motivation index controlling for all other predictors
Student Cohesiveness	.43*	.10
Teacher Support	.43*	.12
Student Involvement	.37	-.07
Student Investigation	.40*	.10
Task Orientation	.61**	.37**
Cooperation	.45	.01
Equity	.50	.03

* $p < .05$, ** $p < .001$

Research Question 2

Research question two, *Which psychosocial learning environment factors have the greatest impact on student self-regulation when learning science?* evaluated how well psychosocial learning factors predicted self-regulation when learning science at the high school level through the use of multiple linear regression analysis. The predictors were the seven psychosocial learning factors (student cohesiveness, teacher support, student involvement, student investigation, task orientation, cooperation, and equity), while the criterion variable was self-regulation. The linear combination of the psychosocial learning factors was significantly related to self-regulation, $F(7, 513) = 49.93$, $p < .001$. The sample multiple correlation was .63, indicating that approximately 41% of the variance in self-regulation can be accounted for by the linear combination of psychosocial learning factors.

The following equation was used to identify relationships between the criterion variable, self-regulation (*SR'*), and the predictor variables, student cohesiveness (*StCoh*), task orientation (*TaOri*), cooperation (*Coop*), equity (*Equ*), teacher support (*TSup*), student involvement (*StInvol*), and student investigation (*StInves*). Unstandardized coefficients were used in this equation.

$$SR' = .05\ StCoh + .53\ TaOri + .01\ Coop - .13\ Equ + .10\ TSup + .04\ StInvol + .10\ StInves + 7.82$$

Table 4.3 presents the indices to indicate the relative strength of the individual predictors. All of the bivariate correlations between the psychosocial learning factors and self-regulation were positive and four of the seven indices were statistically significant ($p < .05$). Only the partial correlation between the psychosocial learning factor of task orientation and the self-regulation index was significant. For every one point increase on the scale for task orientation, motivation to learn science increases by .53. On the basis of these correlational analyses, it is tempting to conclude that the only useful predictor is the psychosocial learning factor of task orientation. It alone accounted for 35% (.595 = .35) of the variance of the motivation index, while the other variables only contributed between 16% and 19%. However, judgments about the relative importance of these predictors are difficult because they are correlated.

Table 4.3

The Bivariate and Partial Correlations of the Predictors with Self-Regulation Index

Predictors	Correlation between each predictor and the self-regulation index	Correlation between each predictor and the self-regulation index controlling for all other predictors
Student Cohesiveness	.40	.06
Teacher Support	.41*	.11
Student Involvement	.42	.03
Student Investigation	.44*	.11
Task Orientation	.60**	.42**
Cooperation	.43	.01
Equity	.40*	-.13

* $p < .05$, ** $p < .001$

Research Question 3

Research question three, *Is there a relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant?* analyzed how well psychosocial learning factors predicted self-regulation when learning science at the high school level while controlling for motivation. A multiple regression analysis was conducted to evaluate whether psychosocial learning factors predicted self-regulation over and above motivation. To test this, motivation was entered into SPSS as the first variance in the model. The psychosocial learning factors were added second to identify significance once the contributing factor of motivation was accounted for within the program. The results showed the seven psychosocial factors accounted for a significant proportion of the self-regulation variance after controlling for the effects of motivation, R^2 change = .08, F (7, 512) = 12.62, p <.001.

The following equation, based on unstandardized coefficients, was used to identify relationships between the criterion variable, self-regulation (*SR'*), and the predictor variables, student cohesiveness (*StCoh*), task orientation (*TaOri*), cooperation (*Coop*), equity (*Equ*), teacher support (*TSup*), student involvement (*StInvol*), and student investigation (*StInves*), while controlling for motivation (*Motiv*).

SR' =.19 Motiv + .004 StCoh + .31 TaOri + .004 Coop - .14 Equ + .05 TSup + .07 StInvol + .06 StInves + .82

Table 4.4 presents the indices to indicate the relative strength of the individual predictors. The partial correlation between the psychosocial learning factor of equity and self-regulation was significant when motivation was held constant. The partial correlation between the psychosocial learning factor of task orientation and self-regulation was also significant when motivation was held constant.

Table 4.4

Partial Correlations of the Predictors with Motivation Index

Predictors	Correlation between each predictor and the motivation index controlling for all other predictors
Student Cohesiveness	.004
Teacher Support	.06
Student Involvement	.08
Student Investigation	.07
Task Orientation	.28*
Cooperation	.004
Equity	-.16*

* $p < .001$

Research Question 4

Research question four, *Is there a significant difference in relationships between grade level and student perceptions of the psychosocial learning environment factors in the science classroom?* examined whether or not a relationship existed between grade level and student perceptions of the psychosocial learning factors while learning science. A one-way multivariate analysis of variance (MANOVA) was conducted to identify any relationships between the psychosocial learning factors and grade level. Significant differences were found among the four grade levels on the psychosocial learning factors, Wilks's $\Lambda = .86$, F (21, 1467.87) = 3.67, $p < .01$. The multivariate η^2, based on Wilks's Λ, was .05, which is considered moderate for effect size (Sink & Mvududu, 2010). Table 4.5 contains the means and standard deviations on the dependent variables for the four groups.

Table 4.5

Means and Standard Deviations on the Dependent Variables for the Four Groups

	Grade	*M*	*SD*	*N*
StCoh	9	29.41	6.25	96
	10	29.02	7.20	156
	11	28.53	6.01	102
	12	30.98	7.45	167
TSup	9	29.18	7.71	96
	10	26.77	7.96	156
	11	25.48	8.40	102
	12	29.90	7.82	167
StInvol	9	27.43	7.85	96
	10	23.02	7.80	156
	11	22.91	7.32	102
	12	25.89	8.42	167
StInves	9	28.22	7.58	96
	10	22.79	8.40	156
	11	21.28	7.69	102
	12	25.28	8.80	167
TaOri	9	31.55	6.31	96
	10	30.12	6.64	156
	11	30.39	6.38	102
	12	31.02	6.43	167
Coop	9	29.85	7.05	96
	10	26.95	8.02	156
	11	27.85	6.36	102
	12	29.98	7.48	167
Equ	9	30.76	7.33	96
	10	29.27	8.11	156
	11	29.12	7.62	102
	12	31.20	7.65	167

Analysis of variances (ANOVA) on the dependent variables were conducted as follow-up tests to the MANOVA. Using the Bonferroni method, each ANOVA was tested at the .0125 level. The ANOVA on the psychosocial learning factor of teacher support was significant, F (3, 517) = 8.53, $p < .001$, $\eta^2 = .05$. The ANOVAs on three other psychosocial learning factors were also significant including student involvement, F (3, 517) = 9.11, $p < .001$, $\eta^2 = .05$, student investigation, F (3, 517) = 14.27, $p < .001$, $\eta^2 = .08$, and cooperation, F (3, 517) = 5.84, $p < .001$, $\eta^2 = .03$. The ANOVA on the psychosocial learning factor of student cohesiveness was nonsignificant, F (3, 517) = 3.42, $p < .02$, $\eta^2 = .02$, as were the ANOVAs on task orientation, F (3, 517) = 1.18, $p < .32$, $\eta^2 = .01$, and equity, F (3, 517) = 2.50, $p < .06$, $\eta^2 = .01$. The four psychosocial learning factors that showed significant differences as they related to grade level were discussed further in Research Question Five.

Research Question 5

Research question five, *How does the influence of psychosocial learning environment factors on motivation and self-regulation differ by grade level when learning science?* used a multiple linear regression analysis to analyze how the psychosocial learning factors differed across grade levels when it came to motivation and self-regulation to learn science at the high school level. The predictors were the four psychosocial learning factors that were significant in RQ4 (teacher support, cooperation, student involvement, and student investigations), while the criterion variables were motivation and self-regulation. The SPSS files were split and multiple regression analyses were run for each grade level. All multiple regression analyses were significant for all grade levels.

The following equations were used to explore the relationships between the criterion variable, motivation (*Motiv'*), and the predictor variables, cooperation (*Coop*), teacher support (*TSup*), student involvement (*StInvol*), and student investigation (*StInves*).

Grade 9 Motiv' = .51 Coop +.43 TSup + .59 StInvol + .12 StInves + 46.10

Grade 10 Motiv' = .45 Coop +.52 TSup - .39 StInvol + .56 StInves + 59.06

Grade 11 Motiv' = .60 Coop +.29 TSup - .42 StInvol + .52 StInves + 60.69

Grade 12 Motiv' = .93 Coop +.44 TSup - .003 StInvol - .04 StInves + 54.36

The partial correlations between the four psychosocial learning factors and the motivation index were not significant at the 9th grade level. The partial correlations between three of the psychosocial learning factors (teacher support, student investigations, and cooperation) and the motivation index were significant at the 10th grade level. The partial correlations between two of the psychosocial learning factors (student investigations and cooperation) and the motivation index were significant at the 11th grade level. The partial correlations between two of the psychosocial learning factors (teacher support and cooperation) and the motivation index were significant at the 12th grade level.

The following equations were used to explore the relationships between the criterion variable, self-regulation (*SR'*), and the predictor variables, cooperation (*Coop*), teacher support (*TSup*), student involvement (*StInvol*), and student investigation (*StInves*).

Grade 9 SR' = .15 Coop +.17 TSup + .08 StInvol + .16 StInves + 13.17

Grade 10 SR' = .12 Coop +.08 TSup + .12 StInvol + .15 StInves + 15.65

Grade 11 SR' = .09 Coop +.21 TSup - .10 StInvol + .17 StInves + 18.44

Grade 12 SR' = .30 Coop +.14 TSup + .06 StInvol + .08 StInves + 12.09

The partial correlations between the four psychosocial learning factors and the self-regulation index were not significant at either the 9th grade level or 10th grade level. Only the partial correlation between the psychosocial learning factor of teacher support and the self-regulation index was significant at the 11th grade level. Only the partial correlation between the psychosocial learning factor of cooperation and the self-regulation index was significant at the 12th grade level. The variables that were significant varied by grade level.

Summary of Findings

This chapter provided an analysis of the quantitative data collected using the WIHIC and SALES to address five research questions. Overall, the findings revealed the relationships between the psychosocial learning factors and both motivation along with self-regulation were statistically significant when a student is working towards learning science at the high school level. In addition, there is a relationship between the psychosocial learning factors and self-regulation when motivation is held constant. Analysis also showed there is a significant difference in relationship between grade level and student perceptions of the psychosocial learning factors when learning science at the high school level.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to identify 9^{th} – 12^{th} grade student perceptions of psychosocial learning environment factors that contribute to motivation and self-regulation when learning science concepts. This study used 2013-2014 archival data collected from a survey conducted with a purposive sampling of high school students sitting in science classrooms within a large urban school district located in southeast Texas. Quantitative data was analyzed using descriptive statistics, multiple regression analysis, and multivariate analysis of variance. This chapter will discuss the findings of the study, limitations that were encountered by the researcher, and implications for future research along with implications for practice within the classroom.

Summary

Research Question 1

Research question one, *Which psychosocial learning environment factors have the greatest influence on student motivation when learning science?*, evaluated how well psychosocial learning factors predicted motivation when learning science at the high school level through the use of multiple linear regression analysis. Data were collected from the What Is Happening In This Class (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) instruments. Results indicated the psychosocial learning factors were significantly related to motivation. That is, all seven psychosocial learning factors, collectively, impacted a high school student's motivation to learn science. In addition, all seven psychosocial learning factors were positively related to a student's motivation which means as the perception of the learning environment improved so did the student's motivation to learn science concepts. Four of the seven psychosocial learning factors (student cohesiveness, teacher support, student investigation, and task orientation) were shown to be statistically significant when combined together as they related to motivation to learn science in the high school classroom.

The results of the study were consistent with the findings of Velayutham and Aldridge (2013) who found there was a significant positive relationship between student perceptions of four psychosocial learning factors (student cohesiveness, teacher support, student investigation, task orientation) and motivation when students were learning science concepts. Psychosocial learning environment factors refer to the factors that create the climate of the science classroom. As supported by previous research, (Aldridge et al., 2012; Bell & Aldridge, 2014) student perceptions of the classroom environment were strongly related to their motivation when it came to learning science. When students perceived a science classroom learning environment as favorable, they were more motivated to learn science.

Student cohesiveness was one factor students perceived as important to their motivation to learn science at the high school level. Having friends in a science class that one can lean on for support and help was perceived as a contributing factor to increasing motivation when learning science concepts on this campus. Students who did not have a support system in class experienced lower motivation to learn science.

Student perceptions of the teacher support factor was an essential piece of the motivation puzzle as students worked towards learning science concepts in grades 9-12. Findings from this study suggested students who felt their teachers cared about them were more motivated to learn science concepts from them. High school students who perceived there was a lack of teacher support in the classroom were less motivated to learn science concepts.

Students in this study also perceived investigations within a science classroom as a critical component to their motivation and desire to learn more science. Opportunities to solve problems and look beyond the notes on a page drive a student to want to learn. Students who participated in investigations were motivated to learn more science. Students who failed to experience investigations within their science classrooms were less motivated to learn science concepts.

Student perceptions of the task orientation factor was statistically significant when grouped with all other factors. For every one point increase on the scale for task orientation, a student's motivation to learn science increases by 1.14. This means students perceived task orientation to be the greatest contributor to their motivation as it related to learning science concepts at the high school level when compared to the other psychosocial learning factors. Students who were in classrooms with clear expectations and who knew the goals of assignments were more motivated to learn science compared to students who were in classrooms who did not know the goals of the assignments and perceived there were few classroom expectations. In addition, students who are offered choice and who feel in control of their learning are more motivated to complete the assigned tasks (Bandura 1994; Nilson, 2013; Zimmerman, 2001).

In summary, student perceptions of the classroom learning environment do impact motivation to learn science at the high school level. Students who perceived the science learning environment more favorably were more motivated to participate in the learning. More specifically, students who walk into a science class having friends in class and knowing the expectations of the day will be more motivated to learn. Teachers who create a classroom environment that includes goal setting and feedback will motivate students to want to learn science each day. This current study was conducted to add to the literature regarding student motivation in the science classroom. It was conducted to increase awareness on how to increase a student's desire to explore science at the high school level. Creating an environment that is supportive of social interactions with clear expectations, goals, and teacher guidance will help students increase their motivation to learn difficult science concepts at the high school level.

Research Question 2

Research question two, *Which psychosocial learning environment factors have the greatest impact on student self-regulation when learning science?* was evaluated using multiple regression analysis. Data were collected from the What Is Happening In This Class (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) instruments. Results indicated the psychosocial learning factors were significantly related to self-regulation. That is, all seven psychosocial learning factors, collectively, directly impact a high school student's self-regulation practices when learning science. In addition, all seven psychosocial learning factors were positively related to a student's self-regulation practices; therefore, as the perception of the learning environment improved so did the student's self-regulation practices when learning science concepts.

Four of the seven psychosocial learning factors (teacher support, student investigations, task orientation, and equity) were shown to be statistically significant when combined together to measure self-regulation as it related to learning science in the high school classroom.

The results of the study were consistent with the findings of Velayutham and Aldridge (2013) who found there was a significant positive relationship between student perceptions of two of the same psychosocial learning factors (student investigations and task orientation) and self-regulation practices when learning science. Students in this study and in the previous study reported investigations during class time was an essential component to self-regulating the learning of science concepts. Those who were given opportunities to investigate problems or test ideas were more likely to self-regulate their science learning. Students who stated they rarely had opportunities to carry out investigations were less likely to self-regulate their learning in the science classroom.

Students in this study perceived task orientation to be the most important contributing factor to self-regulation when learning science concepts. For every one point increase on the scale for task orientation, a student's self-regulation to learn science increases by .53. Students who knew the goals and expectations of the class were more likely to self-regulate their learning practices within the science classroom. Students who stated they did not know the goals of the assignments or who were unsure of the classroom expectations showed a decrease in self-regulation practices within the science classroom.

Results of the study as related to the psychosocial learning factors of teacher support, equity, and self-regulation are not consistent with the Velayutham and Aldridge

(2013) study. Previous research did not find these factors significant; whereas, students in this study perceived both factors as important contributors to their self-regulation practices when learning science. Students in the current study increased their self-regulation practices when learning science in classrooms where they perceived strong teacher support. Students who expressed a lack of teacher support within the classroom also showed low self-regulation practices while learning science at the high school level.

Students in this study also found equity to be essential within a science classroom as it related to self-regulation practices. Those who felt they had equal opportunities to share and answer questions during science class discussions were more likely to exhibit self-regulation during learning. Those who expressed the discussions or treatments were unequal showed a decrease in self-regulation practices while learning science.

In summary, student perceptions of the classroom learning environment do impact self-regulation when learning science at the high school level. Students who perceived the science learning environment more favorably were more self-regulated in their practices and therefore more motivated to learn science concepts. More specifically, students who know the goals of each task will be able to self-direct their learning of the science concepts. Teachers who create a science classroom environment that includes clear expectations, relevant goals, and immediate feedback during the activity will increase each student's ability to self-regulate their learning. This current study was conducted to add to the literature regarding student self-regulation in the science classroom. It was conducted to increase awareness on how to increase a science student's ability to self-direct their own learning at the high school level. Relevant and clear goals each day lead to more engaged and more self-regulated learning within the high school science classroom. A student who is able to self-regulate their learning will be able to return to an assignment, lab, or task when they find their mind is wandering. In addition, self-regulation controls a student's motivation as it is related to learning science; therefore, if a teacher can increase a student's self-regulation by optimizing the task orientation factor then motivation to learn science concepts will increase within the classroom.

Research Question 3

Research question three, *Is there a relationship between a student's psychosocial learning environment and their self-regulation to learn science when motivation is held constant?* was measured using multiple regression analysis. Data were collected from the What Is Happening In This Class (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) instruments. Results indicated the seven psychosocial factors accounted for a significant proportion of the self-regulation variance after controlling for the effects of motivation. Velayutham and Aldridge (2011) found motivation and self-regulation are inter-related with the psychosocial learning factors when students are learning science. Thus, teachers need to target the learning environment in order to improve the motivation and self-regulation practices within a science classroom. This research question removed motivation from the picture, by holding it constant, to determine if there was a relationship between the psychosocial learning factors and self-regulation. That is, if motivation is removed, would students still perceive the same psychosocial learning factors as important contributors to self-regulating their practices when learning science?

Results showed the partial correlation between the psychosocial learning factor of equity and self-regulation was significant when motivation was held constant. Students perceived equity to be a contributing factor to their self-regulation practices when learning science even when motivation was not part of the equation. Students want to be treated fairly regardless of the situation. In addition, the partial correlation between the psychosocial learning factor of task orientation and self-regulation was also found to be significant when motivation was held constant. Students perceived the value of knowing the goals of the assignments and classroom expectations as important contributors to their self-regulation to learn science regardless of motivation.

In summary, student perceptions of the classroom learning environment do impact self-regulation when learning science at the high school level. Students who perceived the science learning environment more favorably were more self-regulated in their practices when learning science concepts even when motivation was held constant. Students who felt like they had equal access to learning science in addition to knowing the goals of each task were better equipped to self-direct their learning of the science concepts. Teachers who created a high school science classroom environment that was equitable for all students and included clear expectations, relevant goals, and immediate feedback during all activities increased each student's ability to self-regulate their learning. This current study was conducted to add to the literature regarding classroom learning environments and their roles in a student's self-regulation practices when learning science. It was conducted to increase awareness on how to improve the classroom learning environment in order to increase a science student's ability to self-direct their own learning at the high school level. While motivation is important, learning science can still occur if motivation is low as long as there is equity, clear expectations, and goals within the classroom. Students are not always going to be motivated to learn science concepts; however, ensuring the classroom environment is perceived as equitable and purposeful will increase the chances of students self-regulating their behavior to learn the important concepts.

Research Question 4

Research question four, *Is there a significant difference in relationships between grade level and student perceptions of the psychosocial learning environment factors in the science classroom?* was analyzed using a one-way multivariate analysis of variance (MANOVA). Data was collected from the What Is Happening In This Class (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) instruments. Significant differences were found among the four grade levels with four of the psychosocial learning factors (teacher support, student involvement, student investigation, and cooperation).

There is limited research, at this time, to support the findings analyzing differences between secondary grade levels with regards to student psychosocial learning factors. However, there is research that suggested students lose interest in learning science as they move up in grade levels (Aschbacher et al., 2013). Further investigation of the research revealed students began to lose interest in science courses when the content became difficult or when the teacher began to focus on covering the topics instead of ensuring students understood the material. Additional findings from the study suggested 9th grade science courses would be the deciding factor as to whether a student would continue to enjoy science or whether they would lose interest in science altogether (Aschbacher et al., 2013).

In summary, student perceptions of the classroom learning environment vary across grade levels. While all psychosocial learning factors have contributed to the overall significance towards motivation and self-regulation as they relate to learning science at the secondary level, four of the factors stand out as significant when the data are analyzed by grade level. Secondary science students' perceptions of the different psychosocial factors and their contribution to learning science vary across grade levels. More specifically, students in grades 9 through 12 have responded that teacher support, student involvement, student investigation, and cooperation looks different across the grade levels. What students perceive as an important learning factor that contributes to motivation and/or self-regulation to learn science in a ninth grade classroom make be different than what senior students perceive as essential to the learning environment within their science classroom. Further analysis of the four psychosocial factors of teacher support, student involvement, student investigation, and cooperation were studied further in research question five.

Research Question 5

Research question five, *How does the influence of psychosocial learning environment factors on motivation and self-regulation differ by grade level when learning science?* was measured using multiple linear regression analysis. Data were collected from the What Is Happening In This Class (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) instruments. Analysis of the data focused on the four psychosocial learning factors (teacher support, student involvement, student investigation, and cooperation) that were found to be significant across the grade levels in research question four. Multiple regression analyses were significant for all grade levels.

Velayutham and Alrdridge (2013) suggested exploring the relationship between the psychosocial learning factors, motivation, and self-regulation across grade levels as a recommendation for future studies to further strengthen research in this area. The initial findings exploring the relationship between the psychosocial learning factors, motivation, and self-regulation are new to the educational research arena with the development of the SALES. Extensive studies have been conducted over the years on the three separate variables of the psychosocial learning environment, motivation, and self-regulation; however, Velayutham and Aldridge (2013) traveled into unchartered waters with the research on all three within a science classroom.

Table 5.1 presents the relationship between grade level and the four psychosocial learning factors as they related to motivation and self-regulation.

Table 5.1

Partial Correlation Summary between Grade Level, Motivation, and Self-Regulation

Grade Level	Motivation	Self-Regulation
9	Partial correlations not significant.	Partial correlations not significant.
10	Teacher support, student investigation, and cooperation significant	Partial correlations not significant.
11	Student investigation and cooperation significant	Teacher support significant
12	Teacher support and cooperation significant	Cooperation significant

Results from this study show all of the psychosocial learning factors play an important role when it comes to motivating and helping a ninth grade student self-regulate their learning within a science classroom. That is, students at the ninth grade level do not perceive one factor to be more important than the other when it comes to impacting their motivation or self-regulation when learning science. Students in the 9th grade perceive cohesiveness, teacher support, involvement, investigation, task orientation, cooperation, and equity as equal contributors to their motivation and self-regulation to learn science concepts in the urban high school classroom.

At the tenth grade level, results suggest teacher support, student investigations, and cooperation were perceived as the most important psychosocial learning factors to science students when it came to motivation to learn science concepts; however, all of the psychosocial learning factors equally contributed to a student's self-regulation practices when it came to learning science. That is, tenth grade science students specifically desire additional teacher support and the opportunity to work with their peers in order to be motivated to learn science. They also need more opportunities to investigate ideas and solve problems; this motivates tenth grade students to want to learn science.

Eleventh grade students perceive student investigations and cooperation as the key contributors to motivation when learning science concepts. Students might be turning into more independent thinkers by this grade level and so perhaps they are more aware of their motivational needs. Eleventh grade students are beginning to plan for college and careers; however, they might be struggling with the science concepts at this point since they are increasing in difficulty. As a result, increasing the opportunities for student investigations within class and offering more opportunities to work with their peers are ways teachers can increase motivation to learn the difficult science concepts. In looking at the relationship between the psychosocial learning factors and self-regulation, eleventh grade students perceived teacher support to be an important factor within the science classroom when it came to self-directing their learning. While all of the psychosocial learning factors are significant, these results suggest teacher support makes the greatest impact for eleventh grade students when it comes to self-regulating their learning in the science classroom.

Results from the study show teacher support and cooperation are important psychosocial learning factors for twelfth graders as they relate to motivation and learning science. Results also show twelfth grade students find the cooperation factor as significant when it comes to self-regulating their learning of science concepts. While twelfth graders are preparing to leave high school, they still argue teacher support within the science classroom is an essential component when it comes to motivation. The teacher plays a critical piece in motivating students to learn science concepts more so than any other factor, besides cooperation with peers. An opportunity to work with peers in the science classroom prepares students to work and interact in the real-world. Interacting with peers helps to develop social interaction skills that are needed to successfully navigate through most working environments and so it is not surprising that students at this level are beginning to understand the value of working with others.

In summary, student needs when it comes to motivating and helping students self-regulate their desire to learn science varies across grade levels at the high school level. Ninth grade student need all seven psychosocial learning factors addressed equally in order to be motivated and self-directed to learn science concepts. Tenth through Twelfth graders also need all seven psychosocial learning factors; however, there are some factors they perceive to be more influential than others when it comes to motivating and/or self-regulating the learning within a high school classroom. This study was conducted to raise awareness on how student needs in the science classroom vary across grade levels. Further investigations analyzing the relationships between psychosocial learning factors and grade level are needed in other schools to support these findings.

Implications

Implications for School Districts

The findings from this study can be used by school districts to create professional developments that target the psychosocial learning factors of high school science students that will increase their motivation and self-regulation when learning science. This study has shown that students perceive all seven of the psychosocial learning factors as important when it comes to both developing their motivation and self-regulation skills within a high school science classroom. Previous research has explained interest in science decreases as students move up in grade levels (Barmby et al., 2008; Logan & Skamp, 2008; Vedder-Weiss & Fortus, 2011, 2012). As a result, school districts need to create professional developments addressing the importance of creating a science learning environment that includes all seven psychosocial learning factors. Students who are motivated to learn science will be more self-regulated in their school work; therefore learning even more science. Students who are more motivated to learn science over the course of their high school career will increase their chances of graduating as scientifically literate citizens. The professional development sessions could occur at the beginning of the school year as part of the often mandatory district staff development days. One activity that could be used during the session could include dividing the teachers into groups and giving them a card sort where each group is asked to place the psychosocial learning factors in order of importance from what they believe students perceive as most important when it comes to motivation in the science classroom. A definition of motivation could be included on the motivation card and discussed whole group prior to the card sort. An explanation of each factor could also be included on each card with the psychosocial learning factor in bold print at the top. A discussion over each leaning factor could occur prior to the card sort so that teachers understood the basics of each factor. Once the teachers placed the cards in order of what they believed students perceived as important, the trainer could share the results of the study and have the teachers check their card sorts. Questions could be asked such as, *Did your group's order match the results from the study? Do these results surprise you? What do you think you could do differently in your classroom to ensure these needs are met so that motivation to learn science increases in all classrooms?* The trainer would then explain self-regulation and have the teachers repeat the card sort focusing on self-regulation instead of motivation. Questions like, *Did your order of importance change? Why or why not? What could you do in your classroom to increase self-regulation when learning science concepts?* could be explored during the second card sort. Teachers could then divide in to groups again based on the grade level taught. The trainer could ask the participants if they thought the order of perceived importance might change by grade level and give them time to discuss. After the initial discussion, the trainer could share the results of the study and allow the grade level teachers time to discuss strategies addressing the psychosocial learning factors along with their impact. Placing these sessions at the beginning of the year would give district coordinators, administrators, specialists, and teachers time to collaborate and create plans where the psychosocial learning factors are specifically addressed within the different science courses.

In addition, campuses could use the administrators or campus content instructional specialists (IS), also called instructional coaches, to meet with grades 10 through 12 to design science learning environments that specifically include the psychosocial learning factors students perceive as the most important to their motivation and self-regulation when learning science. The ISs could share the data from this survey, model strategies for the teachers, and lead round table discussions on ways science teachers could redesign their classroom learning environments to meet the students' needs. Once science teachers are aware of the needs of the students at the various grade levels, administrators and ISs could conduct classroom observations to look for evidence of the strategies being used in the classroom. Classrooms could be videotaped and feedback, along with the footage, could be shared with the teacher. The number one thing everyone must remember within education is that students are the number one priority. Student learning is why administrators, ISs, and teachers are in education; the goal is to help students learn and reach success. One last suggestion for the districts would be for lesson plan templates to include a section that addresses the psychosocial learning factors each week. Teachers in most districts are required to submit weekly lesson plans. Many districts now use online lesson plan templates that are completed by the teacher and then reviewed by campus administrators or ISs. A section could be added to the template asking teachers to explain the following: share the goals you have for your students this week, explain how your students will investigate ideas this week, describe how you will ensure students will receive equal opportunities to answer questions during class discussions, explain how students work with their peers this week, and describe how you will ensure all of your students know you are interested in helping them solve their problems.

All of these suggestions will cost the district minimal funds. If professional development occurs in the summer, after school or on a Saturday, then the district might need to pay an IS to run the session. Additional costs might be incurred if copies need to be made for the sessions. However, if the professional development occurs during a staff development day then the only cost incurred by the district would be for any copies made to distribute to teachers.

Another suggestion would be to ask the district program evaluator or research department to administer the survey in other subjects to see how students perceived other classroom learning environments. The results, if significant, could be used to show other content teachers the importance psychosocial learning factors as they relate to motivation and self-regulation within the classroom. The training could be similar to the training for science teachers.

The final suggestion would be to set goals on the campus that specifically address meeting the psychosocial learning needs of students within a science classroom. These goals could be included in the campus action plan for each campus. For example, *the science department will design lessons with the psychosocial learning factors in mind.* Evaluation of the goal would occur during classroom observations and weekly content team meetings. Another goal could be, *teachers will target at least one psychosocial learning factor each week.* A component within the goal could be, *the specialist will meet* *with teachers once a week focusing on one psychosocial learning factor.* The formal assessment piece would include meeting notes. The specialist could create a small presentation on one learning factor each week during the first 9 weeks of school and share examples of what the factor would look like in the classroom. For example, if task orientation was the focus for the week, the Specialist could discuss the importance of sharing the goals of each lesson and model what this might sound like in the classroom. The specialist could also videotape teachers who have mastered adding task orientation within their lessons to show the team. Once the initial discussions at the campus level are complete, follow-up discussions could occur once a month to discuss the impact of targeting psychosocial learning factors within the lessons. Further training could be planned, if needed, based on feedback from the teachers, administration, specialists, and district coordinators.

Implications for Teachers

The findings from this study can be used by science teachers to design classroom learning environments that encourage motivation and self-regulation within the students. Teachers could use the psychosocial learning factors as a checklist to ensure all components are being addressed within the classroom. The checklist could be included within the weekly lesson plans as a reflection piece for the teacher. Table 5.1 offers an example of reflection questions that could be included within a lesson template for teachers.

Table 5.2

Sample Reflection Questions For Teachers

Student Cohesiveness	How will your students help each other learn this information?
Teacher Support	What specific strategy will you use this week to interact with each student in your classroom?
Student Involvement	What specific strategy will you use that will give each student an opportunity to explain their ideas to others?
Student Investigation	What will students do this week to carry out investigations that answer your questions?
Task Orientation	What will you do to ensure students know the goals of each activity this week?
	What specific strategy will you use to ensure students begin working as soon as they walk in to class this week?
	How will you offer feedback throughout the activities to help students remain on task?
Cooperation	What specific strategy will you use to promote teamwork this week?
Equity	What specific strategy will you use each day this week to ensure all students receive equal opportunities to answer questions?

Science teachers could also collaborate with each other to discuss the classroom learning environments, student work, and to share successes or struggles from the week.

Sharing responses to the reflection question with other teachers could spark new ideas between the teachers that would continue to increase student motivation and self-regulation within the science classroom. Ninth grade science teachers could focus on strategies that target all seven psychosocial learning factors within their classroom since 9th grade students perceive all factors as important to their motivation and self-regulation. Examples of some strategies could be setting clear expectations at the beginning of the year regarding class routines and then having the teacher modeling the expectations on a regular basis. Making sure students know the goals of each activity is another strategy teachers could use to promote learning of science concepts. Embedding quality questions into presentations that will foster student thinking in addition to giving students the opportunity to turn and talk with their peers would help students regulate their thinking and learning of science. Lastly, ensuring that all students have equal access to answering the questions will motivate students to want to learn the concepts so that they can answer the questions.

Tenth and eleventh grade teachers could focus on all seven factors; however, they could also specifically target additional opportunities for teacher support, student investigations, and cooperation activities within the weekly lessons to motivate students to learn the science concepts. This might look like less individual work and more labs where students work in groups investigating ideas with teacher guidance. While twelfth grade science students perceive all psychosocial learning factors as important, they rank teacher support and cooperation at the top when it comes to motivation and self-regulation. Science teachers at this grade level could design activities where students solve problems in groups while also knowing their teachers are there as support when needed.

Ultimately, teachers can directly improve student motivation and self-regulation in the high school science classroom by adjusting controllable factors such as setting clear expectations and goals for each assignment, creating an environment that is student-centered and by offering students opportunities to investigate ideas, ask questions, and problem-solve with their peers. While these may seem like minor adjustments to some; students perceive these factors to be the most important when it comes to ways teachers can motivate high school students to learn science.

Limitations

There were several limitations encountered within this study. One limitation occurred when a student who should be classified as one grade level was classified as a lower grade level due to the number of credits earned. For example, a student could be classified as a tenth grader based on credits earned although they have been in high school for three years and should be classified as an eleventh grader. A second limitation was that although the sample size was large, it did not include equal representation from all populations within the district. A third limitation was the length of the instrument. Some students, especially the 9th graders, noticed the length of the survey and either did not start, stopped responding halfway through, or circled random letters while talking to their peers. Eleventh and twelfth graders seemed eager to give their opinions; whereas, the ninth graders were not really interested in completing the survey. The tenth graders did not seem to have an opinion either way. Another limitation could have been language. Over 50% of the participants in the survey were Hispanic who struggle with the English language. Those who completed the survey may have struggled with understanding the language within the instrument. The campus also performs low on the state reading test; therefore, those who chose not to complete the survey may have done so due to reading issues. The final limitation is that the results are specific to this campus and district.

Recommendations for Future Research

In continuing with the recommendations for future research from Velayutham and Aldridge (2013), further studies could continue to dig deeper into the grade level differences by looking at gender and ethnicity differences. That is, do African American, Asian, Hispanic and White tenth grade students have different perceptions of which psychosocial learning factors are important as they relate to motivation and self-regulation when learning science or do tenth grade females have different motivational needs than tenth grade males?

In addition, this study should be replicated using a sampling that mimics the population of the district. For example, the district within the study was comprised of 38% African Americans, 38% Hispanic, 10% White, 10% Asian, and 4% Other; however, over 50% of the participants in the study were Hispanic. Since participation in this study was voluntary, some students chose not to participate and some chose not to complete the entire survey. The researcher suggests repeating the study with a purposive sampling of students to ensure the demographics are similar to the district demographics.

This study use quantitative data to explore the relationships between student perceptions of psychosocial learning factors, motivation, and self-regulation when learning science. Bell and Aldridge (2014) conducted a study where teachers were given the results of student perceptions of the classroom environment, using a modified version of the WIHIC, to improve their own classroom environments. The study did not target science classrooms and teachers were given the opportunity to choose which factors they wanted to strengthen. Some teachers were asked to keep reflection journals to track their perceptions of the changes during the research. The study conducted for this dissertation could be replicated by administering a pre/post survey to students where science teachers were given the opportunity to see the data from the initial surveys, time to make changes to the learning environment, then administration of a post survey to see if the changes made an impact on student perceptions of the science learning environment. The study could be mixed-methods with the use of focus groups and reflection journals.

This study used a high school in a large urban school district where 90% of the students participate in free or reduced meal programs. It could be replicated in a large suburban school district or in a district where the majority of students do not participate in free or reduced meal programs. There are over 40 languages spoken within the school district and the study could be replicated in an area where only one language is spoken. One final recommendation for future research would be to replicate the study using students enrolled in flipped science classrooms. Results from the current study suggest students need more opportunities to investigate problems and explore various issues within science. Teachers are under pressure to teach a certain amount of curriculum within a certain amount of time; yet they often complain there is not enough time to teach the curriculum and allow students time to investigate during the day. Flipped classrooms move the note-taking and lectures to the evenings in the form of homework to free up the class time for problem-solving, investigations, and hands-on practice. As a result, this researcher wonders how students in a flipped science classroom would perceive the classroom learning environment as it relates to their motivation and self-regulation when learning science.

Conclusion

The purpose of this study was to identify which psychosocial learning environment factors 9^{th} -12^{th} grade students perceive as the most influential in a high school science classroom as they relate to motivation and self-regulation. This study found there was a statistically significant relationship psychosocial learning factors, motivation, and self-regulation when students learned science. In addition, students perceived the psychosocial learning factor of task orientation to be positively correlated with motivation and self-regulation in the science classroom. Data also showed student perceptions of the psychosocial learning factors varied by grade level. The findings of this research were partially supported by previous research conducted on the psychosocial learning environment, motivation, and self-regulation when learning science. This study contributed to the literature due to minimal research specific to high school science student perceptions of the classroom learning environment with regards to motivation and self-regulation across grades 9 through 12 as it relates to learning science content. Students learn in a variety of ways and have different needs. It is essential that science teachers create learning environments were students are motivated to learn the content and self-regulated to continue the learning.

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APPENDIX A

PARENT-STUDENT ACKNOWLEDGEMENT/CONSENT FORM

APPENDIX A

Parent-Student Acknowledgement/ Consent Form

The <u>yellow</u> copy of this form <u>must be signed and returned</u> to the school for each child by **September 5, 2014** or within three days of enrollment.

☐ Yes ☐ No	<u>DIRECTORY INFORMATION</u>: I give the district permission to release the designated information for school-sponsored purposes. (See page 3 in this handbook).
☐ Yes ☐ No	<u>RELEASE of STUDENT INFORMATION</u>: I request that the district not release my child's name, address, and telephone number to a military recruiter or institutions of higher learning without my prior written consent. (See page 3 in this handbook).
☐ Yes ☐ No	<u>PHOTOGRAPH/VIDEO/AUDIO RECORD RELEASE</u>: I agree to allow my son/daughter to be photographed and/or videotaped for the purposes stated in this handbook. (See page 11).
☐ Yes ☐ No	<u>CONSENT/OPT OUT</u>: I give my child permission to participate in the activities, including student surveys, analysis, or evaluation that concerns one or more of the eight areas listed as protected information surveys, under the heading of "PPRA Notice and Consent/Opt-Out for Specific Activities." (See page 3).
☐ Yes ☐ No	<u>USE of STUDENT WORK in DISTRICT PUBLICATIONS</u>: I give the district permission to use my child's artwork, photos, voice recordings, video recordings, or other original work on the district's website, a website affiliated or sponsored by the district, such as a campus or classroom website, and in district publications.
☐ Yes ☐ No	<u>ACCEPTABLE USE and RESPONSIBLE USE POLICIES</u>: I give my child permission to use the district's computers, computer systems, computer networks, software, electronic communication systems, Internet, and district-approved communication tools. I understand that AISD schools use filters to monitor in accordance with the Children's Internet Protection Act. (See pages 4 and 5).
☐ Yes ☐ No	<u>EXTRA CURRICULAR ACTIVITIES GUIDELINES</u>: My child is responsible for following the student responsibilities set forth by Alief ISD. I acknowledge that my child will be held accountable for behavior expectations and consequences set forth by the group or organization in which he/she participates. (See extra-curricular activities on page 24).

Your signature reflects having received a copy of Alief ISD Student Handbook and Code of Conduct. Failure to sign, return, or agree does not exempt a student from compliance.

Student Name: ______________________________ ID #: ____________

Please Print

Student Signature ______________________________ Date: ____________

I understand that the handbook contains information that my child and I may need during the school year and I understand that all students will be held accountable for their behavior and will be subject to the disciplinary consequences outlined in the Student Code of Conduct. If I have questions regarding the handbook or the Code of Conduct, I should direct my questions to the administrators at my child's school.

Parent/Guardian Signature: ______________________________

PARENT COPY

RESUME

RESUME

KATHLEEN BLANCO, M.A., M.E.

EDUCATION

Ed.D.	**Educational Leadership** University of Houston-Clear Lake, Houston, TX Focus: Research Design, Measurement, and Statistics	2015
M.E.	**Secondary Education** Houston Baptist University, Houston, TX	2000
M.A.	**Theological Studies** Houston Baptist University, Houston, TX	2000
B.S.	**Biology and Christianity** Houston Baptist University, Houston, TX	1996

CERTIFICATIONS AND LICENSURES

Biology, Chemistry, and Physical Science Certifications	1998
Special Education EC-12 Certification	2001
Virtual High School Teacher Certification	2011

PROFESSIONAL EXPERIENCE

2008 to Present	Science Instructional Specialist Alief Independent School District
2007 to Present	Associate Online Professor Ashford University
2006-2008	Adjunct Professor Houston Baptist University
2005-2008	Science Educator Alief Independent School District
2004-2008	Adjunct Professor University of Phoenix
2002-2003	Science Department Chair and Educator Fort Bend Independent School District
1998-2002	Science Educator Alief Independent School District