ASSESSING CONTENT MASTERY: USING QUASI-EXPERIMENTAL RESEARCH TO STUDY THE EFFECT THAT STANDARDS-BASED PROGRESS REPORTING TO PARENTS MAY HAVE ON STUDENT ACHIEVEMENT IN SCIENCE AT ONE GEORGIA MIDDLE SCHOOL

by

Matthew Scott Odell

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

With the establishment of standards-based testing as the key assessment of student knowledge gains and with the increased accountability first brought by No Child Left Behind (NCLB) and now with the Every Student Succeeds Act (ESSA), the role of the teacher and the methods of assessment have continued to change. To reach the national goals established by NCLB and the state guidelines established to allow the states to guide education in the ESSA, the testing of students' previous knowledge and the identification of their strengths has become important to show teachers how to meet their students' needs. More empirical research was needed to show whether the collaboration between parents and teachers using standards-based progress reports could improve a student's achievement of science standards. Therefore, this study used a quasi-experimental, cluster randomized control trial utilizing a posttest only format to examine whether the communication to parents of grades on weekly, standards-based progress reports could affect the achievement of 7th and 8th grade science students. The sample consisted of 262 students in one Georgia middle school. A *t*-test for equal variance compared means for 7th and 8th grade students whose parents received a standards-based progress report with those whose parents did not receive one. These *t*-tests returned statistically significant results for all three tests at an alpha of .05, however due to a violation of the assumption of normality, a Mann-Whitney U test was run. Based on the results of the Mann-Whitney U tests, all three null hypotheses were rejected. Effect size measured by Cohen's *d* and eta squared indicated that the use of the standards-based progress report to communicate with parents had a medium, positive effect on academic achievement. Future research, including more testing with different demographics and lengths of time, is recommended.

Keywords: middle-school student, standards-based progress report, academic achievement, standards, and parental communication

Dedication

This work is dedicated to my wife. I would not have made it through this program without her drive to push me when I was full of doubt. During the past few years, she has been my number one supporter. Thank you, Laura, for being the most patient, helpful wife I could ever have. Thank you for all the hours spent whisking the kids to practices, picnics, and stores while I continued to work on this project. Thank you for continually exceeding my expectations of what a Godly wife should be and for pushing me to be the best husband I can be. Thank you for everything you do on a daily basis to make our family the best we can possibly be!

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List of Abbreviations

Adequate Yearly Progress (AYP)

Analysis of Variance (ANOVA)

Elementary and Secondary Education Act (ESEA)

English for Speakers of Other Languages (ESOL)

Every Student Succeeds Act (ESSA)

Georgia Department of Education (GaDOE)

Grade Point Average (GPA)

Individuals with Disabilities Education Act (IDEA)

National Center for the Improvement of Educational Assessment (NCIEA)

National Network of Partnership Schools (NNPS)

No Child Left Behind Act (NCLB)

Parent Teacher Association (PTA)

Parent, Teacher, Student Association (PTSA)

Socioeconomic Status (SES)

Standards-Based Progress Report (SBPR)

U.S. Department of Education (USDOE)

CHAPTER ONE: INTRODUCTION

Overview

From the establishment of standardized testing, increased accountability has pushed teachers to find more effective ways to evaluate and communicate student achievement (Opfer, Henry, & Mashburn, 2008). While there has been progress over the years, there is still not a refined method for efficiently and effectively gathering and communicating standards-based feedback to parents and other stakeholders (Cox, 2011). One of the problems is that research needs to be conducted to determine whether communication with parents, using the standards-based progress report (SBPR), will impact student achievement in the middle school science classroom. The majority of grading is meant to give the parents snapshots of what the student has accomplished at a moment-in-time as opposed to growth estimates of how the student has progressed through the year. The SBPR is a tool that can be used to show academic progress made by the student with specific standards or show how much the student has grown or learned within the context of the subject matter for that academic year. Academic progress shows how much the student has learned (grown) from the beginning of the year to the conclusion of that grade. Using a SBPR would create a baseline, based on Vygotsky's zone of proximal development, and allow Bloom's theory of mastery learning to be used effectively (Guskey & Jung, 2013).

Background

With the establishment of standardized testing as the key assessment of student knowledge gains and with the increased accountability brought first No Child Left Behind (NCLB) and now by the Every Student Success Act (ESSA) (U. S. Department of Education, 2015), the role of the teacher and the methods of assessment have changed. Research has shown

that teachers across the country have seen a change in their role and have had to evolve a set of methods for assessing mastery in public education (Opfer et al., 2008). In 2015, the NCLB was repurposed to form the ESSA. According to the U.S. Department of Education (USDOE, 2015), this act came from officials reauthorizing the Elementary and Secondary Education Act (ESEA). The ESSA law was based on the NCLB, but was created to expand on the progress of parents, communities, and educators across the United States by improving student outcomes (USDOE, 2015). Two examples of the focus and flexibility of the ESSA shown by the USDOE (2015) are the emphasis placed on parent engagement and the parents as partners in education focus.

One of the methods used by science teachers to meet the focus of parents as partners in education is shown in a school system in North Georgia. This system is sending a quarterly progress report to parents showing which standards have been mastered before taking the end-of-year test.

The process of educating children has been a work in progress. Throughout the history of education in the United States, there have been some specific events that have moved educators to further develop these pedagogical practices. One major event that demonstrated a need for change in education was the legal case of Brown v. Board of Education (1954). This case involved individuals who believed that segregation of Blacks and Whites into separate schools did not provide an equal education for everyone. The Supreme Court agreed and decided that such segregation was a denial of the equal protection of the laws (Brown v. Board of Education, 1954).

A second educational milestone was a report called *A Nation at Risk* that was published by the National Commission on Excellence in Education in 1983. This report was a summary of a study completed on the health of public education in the United States. This study indicated

that the health of American education was poor, and that the United States was beginning to lose its competitive edge in the global economy. Some of the recommendations made by the Commission included some basic additions to the curriculum, which included strengthening graduation requirements and establishing standards and expectations for each subject offered. This report was vitally important to the United States and caused the nation to examine the public education system more closely. This examination caused the country to begin to make the changes proposed in the report. At this point, the focus on standards began to spread across the country and slowly became commonplace for all schools. Due to the report's recommendation of more rigorous standards, a majority of states have passed legal requirements for standards for all subjects (Guskey, 2010; O'Connor, 2002; Seiling, 2013).

Another major historical event impacted education in January 2002, when President George W. Bush signed the No Child Left Behind Act (NCLB). This legislation had two main goals: to improve student achievement for all children and to eliminate the achievement gap between students from different backgrounds. If the NCLB Act was to be successful, it would serve to hold schools and districts accountable through the proper use of standards and assessment, provide public school choice and supplemental services for parents and students, force an improvement of qualifications for teachers and paraprofessionals, and would use scientific-based research to improve education (Zhang & Cowen, 2009).

This legislation was expected to produce fully educated adults with the skillset that is required to keep the United States globally competitive. NCLB has served to impact education through increasing the accountability of academic achievement by connecting achievement with standards, benchmarks, grade level expectations, and standards-based assessments (Commission on No Child Left Behind, 2007). This act was replaced by ESSA in 2015. The ESSA kept some

of the rigorous parts of the NCLB such as forcing states to adopt challenging academic standards, having states test students in reading and math once a year in reading and math, and keeping states responsible for keeping schools accountable for student achievement (USDOE, 2015). However, some changes were made in the transition from the NCLB to the ESSA. Each state was given the flexibility to set its own goals for student achievement, states were given the ability to use nationally recognized tests such as the ACT or SAT for testing purposes, and that states must use four academic factors for evaluating schools: (a) English-language proficiency test scores, (b) reading and math test scores, (c) high school graduation rates, and (d) a state-chosen academic measure for middle schools (USDOE, 2015). These historically-relevant events helped to form the landscape of education today. These events required educators to evaluate what worked in education so that more effective methods of educating U.S. students could be formulated (Zhang & Cowen, 2009).

Parents are a vital component of student success in education (Hartnell, 2016). Students not only are more motivated to learn, but parental involvement in the education of students has been shown to have a positive impact on the academic achievement of those students (Berger & Hanze, 2007; Chen & Bonner, 2016; Welsh, D'Agostino, & Kaniskan, 2013). According to Marzano (2000), in the past, educators have used report cards and parent conferences to communicate with parents. The main method of communication has been the traditional report cards that have been used for many years. Marzano (2000) stated that these report cards are often based on norm-referenced assessment methods, and integrate behavior, completed work, and academic mastery of items tested like tests and quizzes into a final average. These traditional report cards have been proven to be ineffective in communicating results to parents about standards-based, academic progress (Marzano, 2000; Seiling, 2013). These traditional

report cards are not able to show the progress of students on specific standards and benchmarks (Seiling, 2013). Criterion-referenced progress reports are more effective because they compare a student's progress to standards, benchmarks, and grade level expectations, not just how well a student has completed assignments (Seiling, 2013). Guskey and Jung (2013) have mentioned that isolated overall letter grades (or overall percentage scores or even average rubric scores) are deficient because they cannot provide the level of detailed feedback necessary to enhance student learning. Standards-based progress reports can guide students, parents, and other educational stakeholders to a clearer understanding of the progression of a student toward the goal of mastering a particular concept. Instead of telling a parent how well a student has completed his or her work, there is now a guide to how well that student is learning and progressing in his or her education (Seiling, 2013).

The result of past events, such as NCLB and *A Nation at Risk*, the standards-based reform movement, has forced school districts to reevaluate the traditional methods of assessing students and reporting the results to parents. While some school districts have begun to discard the traditional method of grade reporting for new standards aligned report cards, many school systems continue to use the traditional report card (Cox, 2011). The practice of students receiving letter grades, such as A, B, C, D, and F, is being replaced by numbering systems; coding systems; and comments such as meets requirements, does not meet, and advanced, that are directly aligned with a student's mastery of individual performance standards (Chen & Bonner, 2016; Spencer, 2012).

Marzano (2000) gave some of the earliest examples of a hybrid standards-based report card that offered traditional grades, along with scores related to individual student performance on standards. Marzano believed that this report card system could have a dual purpose by

offering letter grades, with which students and parents were already familiar, and by rating a student on specific standards (Guskey & Jung 2013; Marzano, 2011).

One reason to offer a hybrid report card is that by providing familiar grades along with unfamiliar scores it may make the transition process easier for the stakeholders who are interpreting its results. According to Cherniss (2008), the Galesburg, Illinois School District transitioned to a standards-based report card that was met with a mixed response. This district used a numbered rubric for students in Grades 3, 4, and 5 that described whether students had met, exceeded, or failed to meet the established, standards-based expectations (Cherniss, 2008). According to Cherniss (2008), while many parents believed that this new report was more informative, many others in the community were uncomfortable with the change. This resistance to change caused the district to develop a hybrid report card, in which letter grades were still utilized, but were equated to the standards (i.e., A = exceeding the standards, B = meeting the standards). This change fits the ideas of some of the earliest proponents of report cards and parents' communication. Wiggins (1991) noted that a report card should, above all else, be user-friendly; parents must be able to easily understand the information it contains. Although one of the main purposes for the standards-based report card is to provide more detailed information to parents regarding their children's learning, it is important that the parent community be given a smooth transition from the old, traditional report card.

While a change in this approach to grading may be a struggle for parents and other educational stakeholders, it is important that they ultimately support the move to standards-based report cards. Guskey (2013) stated that a carefully constructed standards-based report card represents a better-quality reporting tool, with detailed communication about student learning. In order to fully achieve this initiative, it takes support and the involvement of both district and

building leadership, as well as the necessary reporting procedures and protocol to communicate to parents what student progress and achievement should be. He also suggested that a standards-based report card not only offers better and more detailed information about student learning to parents, students, and others, but it also brings focus to the specific standards that need improvement.

At an early age, children learn at various levels, according to their natural abilities, through every day interactions with family members and this requires the formation of a reciprocal relationship between the parent and the child (Wood, Bruner, and Ross , 1976). Goal-oriented behaviors are taught through parental interactions with children at a young age (Wood et al., (1976) defined the learning process as one that includes problem solving and uses prior knowledge or resources to solve those problems. The goal of learning is that as the development of the child occurs, the child should take on more responsibility to plan and implement this problem-solving ability (Craig, 2012).

Through an educational lens, Wood et al., (1976) argued that parents and teachers provide a framework or scaffold that allows each individual child to learn to the best of his or her ability. Scaffolding relies on the buy-in from the student, parents, and teacher to work effectively. As a student becomes secure on one rung of the educational, conceptual ladder, more information or deeper understanding can be added (Bruner, 1985, Wood et al., 1976; Wood, 1980). Effective scaffolding will allow a student to complete a task that may not be possible or could become frustrating to the child otherwise (Stone, 1998). In helping a student with the mastery of a new skill, the goal of any teacher should be to design scaffolding that adequately meets the needs of each learner and to make sure that the scaffolding provided is only what is absolutely necessary for the learner to accomplish the goal or task. The goal is to allow

the student to be able to reach for the acquisition of the skill through engagement, effort, and the proper base of learning (Fernandes-Richards, 2006).

Vygotsky (1978) believed that a child's learning occurs at the child's developmental level. With this in mind, true scaffolding requires knowledge of each student's developmental level. The child's cognitive functioning level is what an educator must know for true scaffolding and Vygotsky believed that this cognitive functioning level is based on already completed developmental cycles. Vygotsky also argued that a child's complete cognitive capability at any particular moment in time includes his or her developmental level combined with what the child could accomplish with the help of others. Vygotsky called this difference between a child's actual developmental level and the developmental level that could be achieved with the help of others, the zone of proximal development. Thus, the zone of proximal development can be thought of as the maturing progression of developing necessary skills. This concept allows stakeholders, such as parents and teachers, a window into what a child has mastered developmentally and what that child is about to master (Fernandes-Richards, 2006).

This concept of the zone of proximal development will be used to identify the educational level of each student within a particular science standard and help them push to a higher level of educational development compared to their starting point. In social constructivist theory, the emphasis is moved from the teacher to the student (Jordan, Carlile, & Stack, 2008). In this case, the student is asked to take more responsibility for his or her learning and become an active participant in educational achievement. By making each student accountable for their learning, the teacher steps to the side and becomes more of a mentor to the student allowing the student frequent opportunities to test their knowledge and see where they still need to improve (Bruner, 1985; Hatch, 2010). Bloom's concept of mastery learning also impacts the idea of standards-

based grading. In looking for ways to close the gap between high-achievers and low-achievers, Bloom demonstrated that students should all be held to a higher standard (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Guskey & Jung, 2013). Social constructivist theory will be used to bring together the student's intrinsic motivation supplemented by the extrinsic motivation of parental communication and frequent accountability (Hatch, 2010). The combination of standard-mastery, active student participation, and parent communication is the basis for this study.

Problem Statement

The literature is still unclear whether communication with parents using the SBPR will increase student achievement in the middle school science classroom. Most research in the area of standards-based mastery focuses on the general comparison of traditional report cards with SBPR (Cox, 2011; Spencer, 2012); however, four major themes have emerged from this data. First, studies show that effective and focused parent communication is essential to high student achievement; however, traditional report cards do not effectively convey the specific strengths and weaknesses of each child (Spencer, 2012). Second, SBPRs are important for conveying specific student successes and struggles to parents. Third, proper frequency and specificity of communication of these strengths and weaknesses can potentially provide a direction to parents who desire to help their child succeed academically (Spencer, 2012; Seiling 2013). Lastly, parents must be taught how to read and utilize these reports to maximize their impact, but the potential is there to completely change the way a grade card or progress report is communicated (Patrick, 2015).

Seiling (2013) established that traditional report cards that are issued every 4-6 weeks do not communicate student progress with enough frequency. Additionally, general letters or

numerical grades do not give an accurate reflection of knowledge gained to allow parents to help their children (O'Conner, 2009). Research shows that general report cards use a combination of factors which potentially cloud an accurate account of the student's achievement, and instead often undervalue hard work and cooperation (Seiling, 2013). Additional research in this area discusses the limitations that letter grades on a report card can have when used as a summation of a variety of different factors, not one (O'Conner, 2009). In spite of this information, many schools are still using traditional report cards that do little to communicate academic achievement on specific standards (Cox, 2011). Factors such as subjective grading, assignments that are completed by a group of students, and homework assignment grades that may or may not be completed solely by the student can impact the student's grades without accurately showing the student's mastery of the material or standards.

Movement to standards-based report cards is explained by Seiling (2013). Since traditional report card grades can be defined as a number or letter that is reported at the end of a time period to summarize student performance, the progress or mastery of the standards is often not clearly shown using this method (O'Connor & Wormeli, 2011). With the move toward standards-based assessment, one possible solution to creating a better communication avenue with parents would be to provide them with a standards-based grading system (Welsh et al., 2013).

Because the mastery of standards is an integral component to achievement, as measured by criterion-referenced tests, parents need to know in which areas they can help their students improve (Seiling, 2013). Marzano and Heflebower (2011) stated that standards-based report cards can fill this void by focusing on the mastery level of each individual standard. Cox (2011) stated that there is little research on the implementation of standards-based report cards at the

middle school level, and this research shows that there is even less known about the use of SBPRs as a communication tool between teachers and parents. The problem is that research needs to be conducted to determine whether communication with parents, using the SBPR, will impact student achievement in the middle school science classroom.

Standards-based progress reports are important for the formative assessment of students to inform them of areas of strength as well as areas that need improvement (Patrick, 2015). A consistent, SBPR utilizes accurately created quizzes, assignments, and projects to show how each individual student is mastering each standard along the way. The consistent use of these reports shows the growth or higher mastery attained, or the lack of mastery attained in a specific area for that school year (Welch et al., 2013). This progress report has the potential to positively impact the educational experience of each student. This progress report can be given to the student and sent home to the parent. A combination of a mastery tracking for the students and a progress report for the parents may be an effective method for informing each stakeholder of the mastery attained (Kyriakides, Charalambous, Creemers, Antoniou, & Demetriou, 2015). The problem, however, is there are no studies that show whether or not the sending of the standards-based progress report to the parents actually affects the achievement of the student.

Purpose Statement

The purpose of this quantitative, cluster-randomized control group study was to examine whether identifying and communicating the academic achievement of students to parents by use of SBPRs would help students improve their academic achievement. This study looked at the difference in means between the scores on a middle school science unit posttest of students whose parents received additional communication in the form of SBPR and the scores on that same middle school science unit posttest of students whose parents did not receive the additional

information. A secondary goal was to ascertain whether the use of standards-based grading, including each standard taught along with a mastery statement for each standard range, would encourage higher academic achievement in middle school science classes by combining parental involvement with test score analysis. The independent variable for this study was the communication of standard mastery information using the SBPR. The dependent variable for this study was the level of academic achievement accomplished by each student as determined by their end of quarter posttest. This study sample included 262 students in a north Georgia middle school. The demographics of this school was 70% Caucasian, 29% Hispanic, and 1% African-American. The results of this study should help teachers understand whether standards-based grading communicated to parents could help students achieve more academic success in middle school science classes. This study also demonstrated how consistent communication between teachers and parents could increase student engagement and understanding of where students are and what they need to do to reach mastery of each standard.

Significance of the Study

Although the number of schools throughout the country that are using standards-based report cards is slowly increasing, the research on implementation at the middle school level is limited (Cox, 2011). Research shows that despite active discussion of using alternative approaches to curriculum and assessment, real changes are taking place too slowly (Guskey, 2013). While there is an increasing number of resources being dedicated to the development and implementation of standards-based report cards, more research is needed before the push to make the use of SBPRs more widely used (Patrick, 2015). To develop a comprehensive standards-based report card, further research is needed to assess how written communication with parents of standards that are mastered and those that are not affects student achievement. While ideas

about grading are gradually changing, specific changes like using grading methods to more accurately reflect knowledge gains or supplementing the grade with additional information are still slow to change (Welsh et al., 2013).

In today's educational climate, schools are held to higher accountability to successfully facilitate the academic success of students, and this accountability includes accurate, useful communication with parents and other stakeholders of that academic success (Kyriakides et al., 2015). Both instruction and assessment practices are highly affected by critical components of a SBPR such as teaching to mastery and diagnosing a student's progress. Since the goal of education is to increase the students' mastery of the information, SBPRs allow the teacher to remediate to each student's needs based on a clear report showing which standards are being mastered and which standards need more work. While the SBPR is beginning to be used a little more, the frequency of communication with parents at the middle school level in science has not increased (Seiling, 2013).

This present study sought to compare mean scores of students whose parents received a SBPR and those students whose parents did not, in order to help determine if this method of standards-mastery reporting is effective and worthy of implementation in future school years.

Research Question

RQ1: Is there a significant difference between the mean scores on a middle school science unit posttest of students whose parents received weekly standards-based progress reports and the students whose parents did not receive weekly standards-based progress reports?

Definitions

1. *Balanced assessments* – The purposeful blending of a variety of assessment tools to provide the best measure of a student's learning, understanding, and abilities, so that

appropriate instructional decisions can be made to enhance student learning (Burke, 2006).

2. *Communication of grades* - The process of informing stakeholders, including students and parents, of a student's academic success or failure. Although this opportunity can be done in face-to-face conferences, this study uses this definition as it relates to the printed document known as a report card (Rundquist, 2012).
3. *Parent involvement* – The inclusion of parents in the education of their children through communication, decision making opportunities, and opportunities to support their children's education at home (Epstein, 2010).
4. *Performance standards* - Criterion-based expectations that provide clear guidance for instruction and assessment of student understanding (Rundquist, 2012).
5. *Standards-based progress reports* - Weekly reports sent out to parents that communicate the numerical average on assessments for each standard. The progress report will have a section for each standard which will state whether the student Does Not Meet; is Improved, but Does Not Meet; is On the Bubble; Meets; or Exceeds for each standard assessed (Seiling, 2013).

CHAPTER TWO: LITERATURE REVIEW

Overview

In the goal of effectively educating students, teachers and researchers have worked to refine the identification and communication of educational progress (Guskey, 2010). One thing that is found in the research is that achievement should be measured accurately and often to ensure that students are able to be active and engaged participants in their own education (Hatch, 2010). The second point that is clear in the research is that communication between the teacher and the parents needs to take place in an efficient, focused way to help guide the student toward greater academic success (Boutte & Johnson, 2014). The research does not clearly show how the consistent, quick communication in the form of a weekly SBPR would allow for the effective communication of academic achievement in a middle school science classroom between teachers and parents.

Theoretical Framework

A goal of education is to teach young men and women the foundational subjects that will help them succeed in life. Part of that goal is to find the most effective method for academic success. To educate all children, not just the motivated ones, it is imperative that communication between all stakeholders is clear and concise. More importantly, this communication between teacher and parents must take place in an efficient, focused way to help guide the student toward achieving academic success, not necessarily by making an A, but by ensuring academic achievement during the school year (Boutte & Johnson, 2014). A specific SBPR will give parents more information about what is being mastered throughout the school year.

This study will use the framework of social constructivist theory (Bruner, 1985) and social cognitive theory (Vygotsky, 1978). The purpose of this study is to show how the concepts

of scaffolding and the zone of proximal development can be used to create a SBPR that can inform both the student and the parent of the student's progress along the road to mastery of the standards and ultimate academic achievement. The study will seek to intertwine the concepts of Bruner (1985) and Vygotsky (1978) by providing a clear, standards-based mastery progress report to parents that shows the achievement of each student for each standard covered.

Related Literature

Social Constructivist Theory

At an early age, children learn at various levels through every day interactions with family members, and this requires the formation of a reciprocal relationship between the parent and the child (Wood et al., 1976). Goal-oriented behaviors are taught through parental interactions with children at a young age (Wood et al., 1976). Wood et al. (1976) defined the learning process as one that includes problem solving and uses prior knowledge or resources to solve those problems. The goal of learning is that as the development of the child occurs, the child should take on more responsibility to plan and implement this problem-solving ability (Craig, 2012). This is accomplished by having a mastery chart on the wall that the students can reference to see which standards they are mastering and which standards they need to work on. This is a critical component of including the student. While this will not be studied specifically in this paper, the importance of communicating with students should not be understated.

Through an educational lens, Wood et al. (1976) argued that parents and teachers provide a framework or scaffold that allows each individual child to learn to the best of his or her ability. Scaffolding relies on the buy-in from the student, parents, and teacher to work effectively. As a student becomes secure on one rung of the educational, conceptual ladder, more information or deeper understanding can be added (Bruner, 1985; Wood, 1980; Wood et al., 1976). Effective

scaffolding will allow a student to complete a task that may not be possible or could become frustrating to the child otherwise (Stone, 1998). In helping a student with the mastery of a new skill, the goal of any teacher should be to design scaffolding that adequately meets the needs of each learner and to make sure that the scaffolding provided is only what is absolutely necessary for the learner to accomplish the goal or task. The goal is to allow the student to be able to reach for the acquisition of the skill through engagement, effort, and the proper base of learning (Fernandes-Richards, 2006). As such, the teacher has a tremendous amount of importance as he or she directs the instruction to meet the needs of individual students, not just the entire class. There are times for group instruction and there are times for individualized mastery and instruction.

Social Cognitive Theory

Vygotsky (1978) believed that learning occurs at the child's developmental level. Having this in mind, true scaffolding requires knowledge of each student's developmental level. The child's cognitive functioning level is what an educator must know for true scaffolding and Vygotsky believed that this cognitive functioning level is based on already completed developmental cycles (Vygotsky, 1978). Vygotsky also argued that a child's complete cognitive capability at any particular moment in time includes his or her developmental level combined with what the child could accomplish with the help of others. Vygotsky called this difference between a child's actual developmental level and the developmental level that could be achieved with the help of others, the zone of proximal development. Thus, the zone of proximal development can be thought of as the maturing progression of developing necessary skills.

This concept allows stakeholders, such as parents and teachers, a window into what a child has mastered developmentally and what that child is about to master (Fernandes-Richards,

2006). This concept of the zone of proximal development will be used to identify the educational level of each student within a specific science standard and help them push to a higher level of educational development compared to their starting point. This will be done by assessing each student's level of mastery, informing parents of this level for each standard, and hopefully helping the parents push their child further toward a higher level of mastery.

Mastery Learning

Bloom's concept of mastery learning (Guskey & Jung, 2013) also impacts the idea of standards-based grading. In looking for ways to close the gap between high-achievers and low-achievers, Bloom demonstrated that students should all be held to a higher standard (Guskey & Jung, 2013). It is evident that each student learns in a different way and at a different pace, so teachers should not assess in only one way. To accomplish the goal of teaching in different ways and at a different pace, teachers should use formative classroom assessments such as standards-based quizzes, oral responses, checks for understanding, and individualized, in-class projects in a dual role to both guide the development of the instructional roadmap for the teacher and to guide the educational emphasis for the students in the class. While this is not being done in the school system, it is an important part of quality education for students. This was not a specific part of this study; however, all students were given extra credit work to complete each week.

It was up to the parents in the treatment group to use the progress reports to guide their students' work. Guskey (2010) pointed out that Bloom desired for teachers to use their assessments, specific tests, as learning tools that could both chart learning progress and provide students with valuable feedback that could identify areas that need improvement. In a true standards-based classroom, educators have taken the necessary steps to ensure that grade reporting is aligned with the method of instruction and assessment of student learning (Guskey,

2010). A standards-based classroom is one that not only accurately identifies the mastery of individual standards that are being attained by each individual student, but it is also one that gives students an opportunity to attain that mastery with individualized remediation and extra work with the material that the student needs (Patrick, 2015).

Grading

There is a significant amount of research on grades and the reporting of grades. One of the more prevalent themes found in the research on grade reporting is on the purpose and intentionality of grading. According to Guskey (2010), there are four general purposes of grading: instructional uses, communicative uses, administrative uses, and guidance uses.

Kyriakides et al. (2015) expounded upon these principles by identifying some general reasons for grading which were to communicate with stakeholders; provide information to students; provide incentive; evaluate mastery of standards; and to select, identify, or group students based on differentiated need. Seiling (2013) provided clear evidence that grading can provide an accurate report which can be used to communicate student understanding with all stakeholders.

With respect to reporting grades, O'Connor (2002) stated that the problem with traditional grades is that one letter or one symbol cannot sufficiently sum up student performance. O'Conner suggested that problems could come from the single-faceted use of only the traditional system of assigning a single letter grade as a summation of a variety of grading factors. This problem would arise from the fact that a variety of information makes it very difficult to clearly understand the meaning of these traditional grades. Seiling (2013) mentioned that certain aspects of grades, such as group projects and homework, can turn grades into a measure of academic accomplishment instead of a true look at the mastery attained by the

student. Kyriakides et al. (2015) explained that even though there are a variety of factors and intentions behind the communication of grades, informing the stakeholders of student achievement should be the underlying premise behind assigning grades. The previous factors lay out the purpose of grading with respect to the three most necessary stakeholders involved in the process: teachers, students, and parents. This theory and its goals point toward the growing need of SBPRs to not only grade students accurately but to use the grades to show areas in which mastery has been attained and standards that still have room for growth.

Guskey (2013) stated that a carefully constructed, standards-based report card represents a better-quality reporting tool, with detailed communication about student learning. He also suggested that the standards-based report card offers better and more detailed information about student learning to parents, students, and others and helps point out specific areas for improvement when needed. Too often teachers become constrained and forced into using a reporting tool that does not align adequately in supporting a standards-based assessment approach.

According to Iamarino (2014), a teacher should employ a standards-based or mastery learning model with specific learning outcomes for students, deliver high-quality initial instruction, administer appropriately written formative assessments to assess progress toward mastery, and use the results to provide feedback to students and parents on how to improve so that the learning outcome is achieved. To achieve the feedback to parents, a SBPR is used to share the information with parents.

The SBPR is a tool that can help identify and share the mastery of the student with each parent so that the zone of proximity can be established, and further academic achievement can be made based on the student's level and ability. This will not only show mastery at the onset of the

standard but will also be a tool that shows the growth in that standard as well as allowing the changes to the zone as the student masters aspects of the standard. An SBPR will contain either a code or a grade for each standard that is being assessed (Guskey, 2015). This code or grade is different due to the lack of a standardized SBPR that has been adopted as the best practice in schools. These SBPRs use a key to help parents identify how their child is progressing. One great way to use an SBPR is to have a homework assignment that correlates directly to the lowest standard that needs the most work. As a part of this study, homework and extra credit work will be sent home with all students. This homework will be a part of the students' grades and will correlate to the set of standards that are being used; however, only the parents that receive the SBPR will know which specific homework assignments should be completed with their students at home. With an SBPR, grading can be based upon the level of achievement compared to the student's ability instead of a general grade made up primarily of achievement.

The Effect of ESEA, NCLB and ESSA on Standards and Standards-Based Grading

As educators in the United States began to realize the need for standards to serve as a guide for classroom learning, the stakeholders decided that improvements needed to be made to the country's educational goals. Generally, the public was becoming increasingly dissatisfied with the quality of public education in the United States, so addressing the educational concerns was of paramount importance. To address these concerns about public education, the ESEA that was passed in 1965 was reauthorized in 2001 as the NCLB. The main goal of the act was to focus on closing the performance gaps that had arisen because of socioeconomic disadvantages of students in public schools that were receiving federal funds (Zhang & Cowen, 2009). This act was billed as a bipartisan effort, and this new policy required students to reach specific levels of proficiency on state standardized achievement tests (Borg, Plumlee, & Stranahan, 2007).

Another specific goal of NCLB was to force the academic content rigor to rise to a more challenging level and to ensure that all schools established consistent, rigorous achievement standards for all students. The requirements that began in 2005-2006 called for mathematics, reading, and science to have the same expectations in skills, knowledge, and achievement levels for all students (USDOE, 2010). The need for these changes came from the dissatisfaction with the educational rigor and academic achievement by students in the United States. By increasing the expected level of rigor, lawmakers were attempting to force schools to raise the bar or standard for educational success.

These were reasonable goals because many children were ill-equipped to succeed in the job market because of clear deficiencies in basic math and reading skills. To address the issue, one of the primary objectives of NCLB was to hold public schools accountable for improving the academic performance of each student (Borg, Plumlee, & Stranahan, 2007). To hold all schools accountable, NCLB created a system of school accountability and established unprecedented federal regulations (Zhang & Cowen, 2009). The performance of students was to be measured by standardized testing assessments.

Because the goal of NCLB was to make sure that all students were held accountable for reaching the necessary achievement levels, assessment results of individual states were mandated by NCLB to disaggregate ethnicity, race, poverty level, limited English, and disability (USDOE, 2001). The guidelines established by the USDOE were required to be applied uniformly to both students and school systems; schools should demonstrate continuous and categorical improvement; progress was to be measured by standardized assessments that had statistical reliability and validity, and data disaggregation needed to be done according to specific student subgroups (USDOE, 2004).

This act was replaced by ESSA in 2015. The ESSA kept some of the rigorous parts of the NCLB, such as forcing states to adopt challenging academic standards, having states test students in reading and math once a year, and keeping states responsible for keeping schools accountable for student achievement (USDOE, 2015). However, some changes were made in the transition from the NCLB to the ESSA. Each state was given the flexibility to set its own goals for student achievement and the ability to use nationally recognized tests such as the ACT or SAT for testing purposes (USDOE, 2015).

Even as the government continues its push to move education forward toward providing rigorous educational standards for students, determining how to positively address and measure these rigorous standards can be challenging. Determining whether the emphasis brought about by NCLB on accountability is helping or harming efforts to close this educational achievement gap is a very complex issue. While the changes brought about by ESSA will help lessen some of the pressure of performing to meet a rigid level and attain adequate yearly performance (AYP), it still pushes for rigorous educational standards and more parental engagement in each student's education (USDOE, 2015). Students who struggle to learn as well as students who achieve mastery of the average concepts should receive the appropriate amount of rigor in their education (Yaffe, Coley, & Pliskin, 2009). The system that many states have in place simply fails to reward schools who make substantial gains (Seiling, 2013). This study will use both the state's choice of rigorous standards and the ESSA's push for parental engagement to examine how to use standards-based mastery communication to improve student achievement in middle school science.

Common Core as it Relates to Science Education

As with all of the subjects, science has changed tremendously as a result of programs such as NCLB and those that preceded it (Ediger, 2014). Because of the previous national focus by NCLB and present state by state focus through ESSA on common standards and testing, vocabulary has again become a key to the mastery of standards. Another related aspect of mastery is how well students can apply their knowledge of the vocabulary and science concepts (Kandel & Brew, 2015). Ediger (2014) stated that not only do students need to learn vocabulary specific to science, but deeper comprehension should be the goal of teaching science vocabulary and of utilizing reading in science. Reading to verify answers to questions or problems, gather data, solve problems, determine whether a hypothesis is correct, and to analyze data are the main reasons for science vocabulary literacy (Kandel & Brew, 2015). Science and vocabulary make up an essential part of the mastery of concepts and can be analyzed with leveled questioning to measure the depth of mastery within that science concept. The science teacher must become a teacher of reading to more fully assist pupils in fluent reading (Ediger, 2014).

According to Kandel and Brew (2015), the use of multiple activities allows teachers to gauge students' understanding of content material and tap into individual learning needs based on the feedback that is received from the journal created by the student. At lower levels, Common Core standards can be taught and assessed with these same types of journals. Lee, Mahotiere, Salinas, Penfield, and Maerten-Rivera (2009) stated that the use of student booklets that included activities and ideas for building up the reading and writing skills of struggling students will give them a much better chance to master the standards of any subject. The journal can act as another way to allow the students to demonstrate their mastery of the standards in

science and can act as another way to scaffold from one level of mastery toward another such as moving from reciting from memory to application of that knowledge.

To help align standards-based methods with the Common Core, weekly tests and written journal responses can be used along with rubrics to assess student mastery of the concepts. The combined use of these journal responses, notebook entries, weekly, standard-based quizzes, and communication of these formative assessments allows parents to be plugged into the growth and learning that their child is experiencing.

Making parents more informed will also help schools better align themselves with the ESSA. These assessments can also be used as study materials for parents who want to help their child grow in a weak area in that subject. Though this study does not have room to delve deeply into all of the different areas of mastering standards, the communication of standards mastery with the SBPR could be a possible factor to allow parents to work with their children.

These formative assessments guide instruction and help teachers measure the student's level of mastery along the continuum. Formative assessments allow teachers to diagnose where each individual student is along the continuum so that each student has a chance to master the standards that he or she has not yet mastered. These assessments will also help teachers make informed decisions about each student's need for remediation of a standard or whether that student is ready to accelerate within the standard by using application or creativity. One of the most important aspects in assisting students to master the Common Core standards is allowing them to show incremental improvement throughout the entire year (Kandel & Brew, 2015).

Quizzes are a very popular and individual way to show standards-based progress for a student. Using quizzes that have questions of varying depth, a teacher can get a true look at the student's mastery of the concepts being taught. Standards-based quizzes show an individual

snapshot of a student's knowledge. Labs and homework assignments can be more easily influenced by peers or others so these types of assignments cloud the assessment of mastery for individual students. Students can start at lower levels, scaffold to higher levels, and attain a high level of mastery. Standard-based quizzes can show that progression which can be shared with parents on the SBPR (Seiling, 2013).

The use of these strategies, along with the tracking of the progress for students that are struggling to master reading and writing in science, has shown success. Tracking the mastery of reading and science in English for Speakers of Other Languages (ESOL) students has allowed for sustained success in learning and mastery of skills (August et al., 2014). According to August et al. (2014), the use of different interventions such as extra work, parental communication, tracking of progress, and small group work showed significant pretest to posttest gains in science achievement for students in a treatment group that included current ESOL students, students exited within two years from ESOL, and students who had never been in ESOL or had been exited from ESOL for more than two years. August et al. (2014) found comparable gains on the scores of the posttest for all three populations tested (including students currently in ESOL, students who had exited from ESOL, and students that had never been in ESOL). This seems to suggest that these interventions are not only effective within specific subgroups of students based on their ESOL status, but on different groups in the science classroom. This study also shows that different groups of students can learn when their skills are identified, a plan is put in place which includes parental involvement, and the students are tracked and compared to their previous skill and to the standard skills for that subject.

The literature seems to indicate that Common Core standards require the use of many of the same methods for teaching science, but that the focus on vocabulary, through science

journals, and the tracking of mastery through testing and rubrics could be an indicator of whether each student is truly mastering the science content in the classroom. Using a standard-based rubric compiled from weekly quizzes, interactive notebooks, rubric-graded assignments, and student-teacher discussion can be a very useful tool for parents who desire to work with their children to help facilitate greater mastery of the subject matter being taught (Guskey, 2015). This study primarily used the results of standard-based quizzes to inform parents of the progression of their child toward full mastery of the subject matter in seventh- and eighth-grade science classrooms. This researcher hopes to prove whether the consistent, weekly communication with parents of standard-based progress will result in greater learning for their children.

Summative Standards-Based Assessment

As a result of NCLB, all states use some form of assessment to track academic achievement. These standardized tests are also characterized as high stakes testing. After NCLB was passed, the number of standardized state tests increased tremendously. Graduation from high school and grade promotion are now being determined partially based on these high stakes tests (Yaffe et al., 2009). There are three primary features of high stakes tests. First, each student is required to be tested. Second, measuring academic achievement through the use of standardized tests is the largest and most relied upon measuring stick for NCLB compliance. Third, a centralized educational system with rewards and punishments are being connected solely to student performance on standardized tests (Berlak & Berlak, 2011).

Because of these past NCLB compliance concerns, related standardized testing has been placed at the top of America's educational agenda. A bipartisan group of educators, reformers and other policy makers, has agreed that there must be a closure in the achievement gap if the

United States is to remain a dominant economic force in the world (Yaffe et al., 2009). The use of standardized test scores was never meant to be the final measuring stick for student achievement, but to be used as a gauge to measure school success (Seiling, 2013). Unfortunately, its dominant use has distorted the educational system.

Gong, the Executive Director of the National Center for the Improvement of Educational Assessment (NCIEA), believed that standards-based assessments can have a positive effect on narrowing the achievement gap, but not within the current structure (Yaffe et al., 2009). This may be because of the way that standardized measurement allows teachers to drill information that a student has not mastered (Simon, Erduran, & Osborne, 2006). Gong (date) did not believe that the annual standardized tests should be thrown out, but that they should be looked at as a part of the picture and not as the final word on academic success. Teachers should not be focusing on one test to prove mastery of the standards, but should be using multiple assessments throughout the year to show the amount of mastery attained by the student (Guskey, 2015). These SBPRs can help because they track each student's mastery throughout the year, not by using one test. Gong believed that the tests should be refined and developed to help teachers improve instruction, which should lead to success in college and the workplace, which are the true goals of education (Yaffe et al., 2009).

All students should have an opportunity to learn; state curricula and state level policies are more likely to ensure that this happens. The aspects of common curriculum standards across the state of Georgia, common frameworks by grade and subject that allow subject-level teachers to develop a teaching plan, and post data sheets that allow teachers to ascertain which areas have high or low mastery are all tools to help teachers put students in the best position to learn the content for a specific school year. To accomplish this goal, Kyriakides et al. (2015) placed the

burden of responsibility on all educational stakeholders. Educational stakeholders such as the teacher, principal, and parents must all work hard to ensure that each child is successful to the best of his or her ability.

Standards-based grading ensures that over time, those deficiencies are identified so that the teacher can differentiate to the individual needs of each student instead of attempting to address an entire class in whole instruction or remediation and allow stakeholders to be aware of the needs of their children. In this study, whole-class instruction will be given as to reduce the possibility of a confounding variable. The difference will come in the SBPR that parents will be able to utilize when deciding which homework or extra credit the student needs to work on.

Using Formative Standards-Based Assessment to Monitor Progress

Not only are standards-based tests becoming more frequently used, but grading is slowly beginning to change to a more standards-based method (Seiling, 2013). Grading should be attached to standards-based assessment to ensure there is a correlation between mastering standards and reaching the desired grade. According to Spencer (2012), standards-based assessment derives from the idea that teachers ought to have clearly defined academic goals for their students, be able to determine if they have met those goals, and then communicate that to students and their parents. When grading based on standard mastery, it is important to keep a narrow focus and rely solely on the results of each individual assessment instead of giving a grade partially-based on the completion of work in class. An example of this can include points for working well with a group. This can be a part of a classroom grade on an assignment, but it may cause the assignment to artificially inflate the grade. Therefore, this type of grade cannot be used as a formative assessment of a student's progress toward the mastery of a specific standard. According to Spencer (2012), like a traditional report card, standards-based grading includes an

overall grade or, for middle and high-school students, a percentage grade for each class in which a student is enrolled.

Guskey and Jung (2013) emphasized that each subject and grade needs a small, high quality set of standards that keeps the broad stroke of the curriculum intact. These standards must be focused and attached to a high quality set of tests to measure the mastery of each standard. Marzano (2011) also stated that standards should be precisely worded to ensure accurate instruction and eliminate guesswork on the part of the teacher. To allow for accurate assessment of mastery, these standards-based tests should be tiered to test all levels of learning. Trying to better understand how to make assessments and grades match standards mastery, researchers conducted a survey of teachers to determine how and to what degree standards were covered in the classroom (Guskey & Jung, 2013). The results showed that having standards and mentioning them regularly in the classroom were useful if they were well-aligned with the test or assessment tool. While this researcher provided the individual students with their own mastery charts on the bulletin board (by random number, not names), this was not tested as part of this particular study.

In traditional school structures, tests and grades have often been categorized as assessments of knowledge at the end of a unit (Iamarino, 2014). These scores are all recorded in a grade book and averaged together, but these scores only give an overall assessment of a student's quality of work over a quarter, not the student's knowledge level. In contrast, standards-based grading systems allow educators to move away from this generic grading system and focus on attaching grades or analysis to each standard to show what the student has mastered and on which standard areas the student has room to grow (Guskey, 2015). This type of grading scale shows parents and students the science standards for the year, the student's mastery, and

defines what must be accomplished to master the weaker standards. By giving specific information on each individual standard and providing parents with standards-focused homework materials, this researcher believed that parents will help their students work to achieve mastery of some of the standards.

According to Tognolini and Stanley (2007), one of the main advantages of moving to a standards-referenced system is that students are awarded grades that describe what it is they know and can do, in addition to where they are relative to their peers. Students achieve in direct relation to predetermined standards for that grade. Since standards and assessment remain constant over time, stakeholders can compare performance and monitor the results of each student against fixed standards over time, which will allow teachers to look for areas that are mastered and those that need improvement (Nichols, 2012). It is important to note that the state standards and assessments can be constant, but the specific standards that the students are working on within the overall set of standards can be different.

There are potential roadblocks to using standards-based grading to assess mastery and share that mastery level with stakeholders. Guskey and Jung (2013) explained that while standards-based grading is gaining popularity and seems to be best practice in education, standards-based grading will prove highly inaccurate without giving teachers proper guidance and support on how to collect, interpret, and use the assessment data. To combat this, this researcher discussed the best practices and helped teachers at the study site provide accurate, standards-based communication to parents.

Another important aspect to standard-based grading is the importance of reliable, teacher-made, standards-aligned assessments that are created at the proper level for the students in a particular grade. Iamarino (2014) pointed out that tests should not be given for the sake of

testing, but to accurately analyze the progress that students are making toward mastery of the subject matter. For SBPRs to be effective, the questions must be aligned to the standards and be narrowly focused to measure the student's understanding of the material (Guskey, 2015).

Another potential downside to standards-based grading is the potential time consumption. Teachers must fully understand the operations and reasoning behind standards-based grading. They should also be given the proper time to update the standards-based grades throughout the school year. An area that teachers must be careful to avoid is that of giving the students a label of failure (Iamarino, 2014). The goal of assessment for learning is not to eliminate failure, but rather to keep failure from becoming chronic and inevitable in the mind of the learner. To accomplish this, it is essential that standards-based grading show areas of improvement without giving the illusion of failure to the student.

Using Standards-based Assessment to Drive Instruction

To properly allow assessment to drive instruction in the classroom, teachers must change the way they think about assessment and instruction. Marzano and Heflebower (2011) suggested that formative assessment should be regarded as a key professional skill for teachers, because using formative assessment effectively often requires teachers to change their thinking regarding classroom roles and behavioral norms. This means that instead of grading students on academic accomplishments such as a combination of quiz scores, lab assignments, homework completed, etc., teachers begin to base their grades on the mastery of the material and use only assignments that can be compiled to show an individual student's mastery of the standards.

Instruction in the classroom should be driven by the formative assessments that students complete and by the identified corporate and individual weaknesses that are uncovered by the assessment. Formative assessments should include but are not limited to rubric-graded

assignments, interactive notebooks, writing samples, and standard-based quizzes (Seiling, 2013). These formative assessments should be numerous and should be the dominant grades in a SBPR because these types of grades can show a forward progression along the continuum of mastery for a particular subject (Welsh et al., 2013).

Again, Vygotsky (1978) pointed out that students must be able to work independently without too much frustration, (Hatch, 2010). One of the ways to allow the assessment to drive instruction is to allow the students an opportunity to be a part of the assessment or evaluation. Allowing students to become a part of the evaluation process will motivate them to achieve at a higher level. Ownership in their grade is a key to high level mastery of the standards (Hartnell, 2016). This is a way to allow students to showcase their mastery of the standards while also allowing teachers to evaluate areas that need improvement.

Impact of Standards-based Assessment on Science Learning

The science classroom is one area where standards-based grading can impact learning. Success in science requires that students be able to grasp new concepts and learn many new vocabulary terms, often building upon previous standards and knowledge. In 2005, Noble, Norman, and Farah discussed the link between low-socioeconomic status (SES) factors and school achievement, by observing the limited background experiences and lower language skills of children living in poverty. These factors were shown to directly impact science learning because of its associated vocabulary requirements and demands for abstract understanding (Meyer, 2012). The students' lack of experiences related to science (Meyer, 2012). As students show mastery of specific science standards on their SBPR, teachers will be able to identify the areas of need and focus on differentiating the content to meet the needs of the student.

Identifying Effective Parental Involvement

While many educational practitioners, teachers, and researchers support the policy direction of increased parent involvement, few agree about what constitutes effective involvement (Epstein, 2001; Sanders, 1999). There is still much confusion regarding the activities, goals, and desired outcomes of most parental involvement activities and policies. In earlier studies conducted by Baker and Soden (1998), they emphasized the importance of parent involvement. However, the importance of parental involvement is often generalized, and the data is not used to distinguish the different types of parental involvement. It is important to determine each level of perceived importance of parental involvement in the eyes of teachers and parents as it relates to students and each student's education (Weiss & Stephen, 2009).

Epstein (2010) described six types of parent involvement which are essential for a student's success throughout school. Parents actively participate in the educational process when they enhance their parenting skills, construct positive lines of communication between home and school, volunteer in schools, provide extended learning opportunities at home, contribute to academic decisions, and support education in the community (Epstein, 2010). Epstein ascertained the main types of parental involvement based on research conducted for the National Network of Partnership Schools (NNPS). The goal of the NNPS Framework is to help schools identify ways that families and community partners can be involved without being required to meet at the school. In a survey by Epstein (2008), 97% of teachers were found to believe that parental involvement initiatives were very difficult to meet. However, if the school staff focuses on the following six types of parental involvement, they should have a better understanding of effective parental involvement.

- Type 1: Parenting—Parenting activities help families understand adolescent development, strengthen parenting skills and set home conditions for learning.
- Type 2: Communicating—Two-way communicating activities keep families informed about and involved in school programs and students' progress.
- Type 3: Volunteering—Activities that facilitate volunteerism improve the recruitment, training, and schedules of volunteer stakeholders to support student activities and school programs.
- Type 4: Learning at home—Learning-at-home activities, designed for students and their families are coordinated with the students' classwork and curricula.
- Type 5: Decision making—Decision-making activities include families' voices in developing mission statements and in designing, reviewing, and improving school policies that affect students and families.
- Type 6: Collaborating with the community—Collaborating with the community activities draw upon and coordinate the resources of businesses; cultural, civic, and religious organizations; senior citizen groups; colleges and universities; government agencies; and other associations to strengthen school programs, family practices, and student learning and development (Epstein, 2008).

The Effect of Title I on Parent Involvement and Education

Research points to the impact of strong parental partnerships between teachers and parents, but teacher-parent partnerships are not the only partnerships available (Morris et al., 2011). There are partners, such as other stakeholders, that believe in the building of relationships between schools and parents. In accordance with including multiple stakeholders in education, the Georgia Department of Education (GADOE, 2013) has published several specific parental

involvement guidelines. According to the GADOE (2013), the Parent Engagement Program ensures that Title I, Part A parental involvement regulations are met with meaningful and strategic actions to build parent capacity as mandated by the ESEA of 1965. The GADOE supports research on parental involvement by working with school districts to implement researched-based strategies by delivering communications, by creating partnerships, by monitoring the Title I Schools that receive Part A funds, and by collaborating with local Parent Teacher Association (PTA) and Parent, Teacher, Student Association (PTSA) groups to help improve the program which they hope will aid in student achievement (GADOE, 2013).

Title I of the ESEA of 1965 was implemented to provide federally-funded financial assistance to state and local education agencies for the purpose of meeting the needs of educationally disadvantaged students. The creation of Title I was designed to improve educational outcomes for students and to create educational opportunities for low-achieving students from low-SES schools by providing a variety of essential supplemental services (Borman & D'Agostino, 1995).

The Title I Act requires that each state adopt challenging student academic achievement standards and academic content standards. It also requires that every state provide each and every public elementary and secondary school child with the same academic standards (USDOE 2004; Gorey, 2009). While the states determine the specific criteria for meeting Title I eligibility, schools must follow the general guidelines of the USDOE, in that funds shall be used to serve the lowest achieving schools and funds shall be given to schools that demonstrate the greatest need and the strongest commitment to school improvement. States are currently allocating federal funds using a statutory formula that is based on the cost of education and census poverty estimates in each state (USDOE, 2004; Gorey, 2009). Historically, Title I

funding has always been provided to students who were educationally disadvantaged, and this is evident in both Title I and NCLB, as they both have the eradication of academic achievement gaps as one of their primary goals (Gorey, 2009).

An example of a Title I program is *Success by Ten* (Ludwig & Sawhill, 2007) which has the goal of helping every student achieve academic success by the age of ten. *Success by Ten* calls for an expansion of the Early Head Start and Head Start programs that provide disadvantaged children with an opportunity for high quality education during the first five years of their lives. To compensate for attending low quality schools after the initial program, the second phase, Title I spending, is devoted to programs that provide proven instruction with a focus on improving reading (Ludwig & Sawhill, 2007).

Borman and D'Agostino (1995) used a meta-analysis study to evaluate Title I programs to consider whether its program services had a significant impact on student achievement. The original expectations of Title I were to close the achievement gap, but evidence from this study showed that the Title I program has indeed fallen short of closing the achievement gap. The findings did show that the achievement gap would have been greater without the intervention of Title I programs. The authors of the meta-analysis concluded that Title I has been and continues to be an important resource for improving educational instruction in schools that serve disadvantaged students (Borman & D'Agostino, 1995). According to the literature above, Title I continues to make an impact on the improvement of academic achievement of low-SES students, the increase of academic opportunities for low-SES students, and the increase in parent involvement in the education of all students.

Not only does parental influence and involvement play a part in a student's academic success, but Title One also shows that the environment in which the student lives also plays a

significant role on the academic success of students in the school system. Teachman (2008) found a strong bi-variate relationship between educational well-being and a student's living arrangements. It was found that children who lived with biological parents experienced less turbulence than children who lived in alternative families. The level of turbulence in a student's environment has a direct effect on each student's school engagement and in participation in school extracurricular activities. In a parenting context, children living with married, biological parents participated more in religious and community groups and were less likely to suffer from poor mental health. In economic resources, it was found that children who live with alternative families have a greater chance to be victims of financial hardship (Teachman, 2008).

Factors of the Home that Affect a Student's Achievement

Parental involvement affects many areas of education including attendance and student participation and this is based upon the parents' degree of caring (Sheppard, 2009). In a study conducted by Sheppard (2009), it was found that students with lower academic success had parents who failed to attend parent meetings and activities. They, however, blamed it on outside factors such as work, younger children, or just dealing with life issues. This study showed how the educational priorities of parents can affect their child's educational success. Special education seems to have concerns related to parental involvement. Parents of students with disabilities tend to need to be more involved than other parents. The Individuals with Disabilities Education Act (IDEA), parent advocacy, and other rights of students are all issues of which parents and teachers need to be aware. A study conducted by Trainor (2010) related to parents of students with disabilities found that parent advocacy is important to the success of every student regardless of the parent's educational level.

A joint collaboration effort is essential to actively involve parents in the academic achievement of their children. In a similar study on how parents and teachers view school communities, Redding (2008) found that high stakes testing and academic achievement took precedence over the social aspects within the learning environment, especially where parental involvement activities were concerned. Gardner and Miranda (2001) found that four areas must be considered if the educational challenges are to be overcome: (a) culturally sensitive assessment, (b) empirically based instruction, (c) positive behavior management, and (d) parent/community involvement.

Reilly (2008) explained how teachers felt about parental involvement at the middle school level. Reilly found that teachers have many tasks, and some would rather not contact the home unless there is a problem. Unfortunately, this can lead parents to expect negative communication instead of positive messages. Teachers are often held responsible for making the first contact and then keeping the communication going throughout the school year. While many teachers feel they do not want to contact parents unless a child is failing or there is a major discipline problem, it may not be good practice to limit the amount and quality of contact with the parents.

While researchers have gathered a great deal of information about the positive impact of parents in elementary schools, the unfortunate truth is that parents tend to visit schools less during a student's middle school and senior high years (Patrick, 2015; Seiling, 2013). Reilly further found that many middle and high school parents were not as equipped to assist their students as they approached adolescence. These parents said that they needed guidance on how to best do this while ensuring that their students were independent and successful at school

(Reilly, 2008). This is a concern that must be remedied before academic achievement is able to improve at the rate that is desired by the educational stakeholders of the United States.

Taliaferro, DeCuir-Gunby, and Allen-Eckard (2009) conducted voluntary interviews of teachers about their views of effective parental involvement activities. According to this study, the perceptions of the school staff regarding parental involvement initiatives and implementation can affect the success or failure of a program. Teachers' attitudes can cause programs to be effective or ineffective. Self-efficacy is positively impacted by accomplishments, inclusion, and facilitated methods (Taliaferro et al., 2009).

Problems can arise between parents and teachers, and the teachers' beliefs about parental involvement and their actions toward promoting this involvement are often mismatched when parents show a desire to be involved (Souto-Manning & Swick, 2006). This indicates that educators may be lacking the understanding of how to actively involve families, but simply feel that the involvement is necessary. This holds true when parents come to the teacher for suggestions and the teacher does not appear responsive or helpful in identifying areas where the parents can assist in the academic achievement of their children. Identifying areas of need for each child and providing sources of help for parents to use is an integral part of this study.

In their study, Sharon and Nimisha (2009) suggested that there is a need to improve parent involvement and teacher communication measurement instruments. The data used in the study were collected from parents and teachers in two Title I middle schools in one urban school district. The study showed that as parents responded to their children's changing developmental and educational needs and requests, their type and quality of involvement changed. One finding from this study indicated that parental involvement is low in middle school as a result of the psychological and social development of the adolescent child. Sharon and Nimisha (2009)

pointed out that the increased maturity and autonomy levels of students are determining factors as to how and why teachers and parents collaborate in middle school.

Perceptions of Parents and Students on Parental Involvement

The perception of parents regarding their involvement in education can have a powerful impact on a student's motivation and academic performance. Understanding why these perceptions occur is important. Barge and Loges (2003) found that parents, students, and teachers hold similar concepts of what counts as parental involvement. They found that parental involvement had a positive impact on the socialization and general life skills of their children. Ghazi, Ali, Shahzad, and Khan (2010) discovered that the daily needs of students needed to be taken into consideration as well as their academics, and that the impact of parents was of vital importance to the proper fulfillment of those needs so that meaningful education could happen.

Along with realizing the impact of parents on a student's meaningful education, it is important for teachers to avoid making premature assumptions about parents and family life. Premature assumptions by teachers regarding parental involvement can be detrimental to the building of relationships with parents. Often these assumptions are made before a parent's perceptions of the teacher are formed, and these erroneous assumptions can lead to a lack of parental involvement because the teacher never reaches out (Seiling, 2013). A study by Knopf and Swick (2007) found that one common misconception can occur when teachers mistakenly think that they know the perceptions of parents but, often, they are wrong, indicating that educators often base their ideas on stereotypes. Knopf and Swick (2007) found that parents do have differing views than teachers and that it is the job of the teachers to create avenues in which parents can be involved and recognize the ways that the parents are actively involving themselves. The inability to see a common vision can become a stumbling block to a strong

parent-teacher relationship. Redding (2008), in his study comparing parents and teachers, found that teachers' perceptions of parents were lower than parents' perceptions of teachers. Incorrect perceptions between the family and the school often exist in those schools where parental involvement is low.

In education, the self-efficacy of the parents can lead to the same self-efficacy in their children. This positive or negative self-efficacy can affect their perception of the educational environment. Positive self-efficacy can bring open communication while negative self-efficacy can create a continued cycle of disconnect between the home and the school (Gould, 2011). O'Connor and Wormeli (2011) also found that teachers should consider the cultural background of the parents and students as they attempt to encourage parental involvement. Gould (2011) analyzed the relationship between parental involvement in the education of middle school students and the students' self-efficacy. Gould found that there was a relationship between these two factors. He found that parental involvement was indeed a motivating factor for middle school aged students. This empirical data seems to show a definite connection between communication with parents, parental involvement, and student achievement.

Standards-based Report Cards as a Means of Communication

The primary goal of teachers is to help students achieve a higher level of learning than was previously attained. One of the main ways that teachers can motivate each student to achieve to the best of his or her ability is to communicate consistently with parents. Progress reports and report cards are a major avenue for this communication. Understanding the achievement level of the student, reporting grades based on achievement and effort, and improving the communication with parents are important goals for any report card.

The SBPRs differ from traditional letter grade, percentage, narrative, or pass/fail report cards by requiring teachers to report student performance levels on specific educational goals, or standards, instead of broad content areas or categories (Welsh et al., 2013). It is believed that if teachers must assess student progress on precise goals or objectives, they will be more likely to focus their instruction on them as well. School districts implement SBPRs to provide a measure of standards mastery that helps parents understand the level at which their child has achieved on state standards. Taken together, SBPRs and state assessment scores can provide a rich description of each student's academic progress than is provided with traditional report cards (Welsh et al., 2013). There has been an increase in the popularity of SBPRs because they are believed to improve communication with parents (Hartnell, 2016).

The SBPRs have been used in a variety of ways by school districts across the United States, and because of this variety of uses, the SBPRs have taken on a variety of forms (Chen & Bonner, 2016). While SBPRs usually report performance on specific standards rather than broad content areas and abandon traditional letter grades in favor of different achievement descriptors, SBPRs vary in their choice of standards and achievement descriptors. SBPRs include many, standards-based objectives (e.g., multiplies two-digit numbers, identifies author purpose, etc.), and districts can choose to adopt the performance level descriptors used on the state assessment (e.g., advanced, proficient, basic, and below basic) while others use district-developed terms (Guskey, 2010).

SBPRs are an established way of reporting student learning, and have been addressed by multiple researchers (Guskey, 2010; Scriffiny, 2008). One established, yet important, advantage of SBPRs is that they improve communication about student achievement (Seiling, 2013). The communication is improved by helping teachers differentiate between process, progress, and the

quality of student work products (Guskey, 2015). SBPRs have emerged more recently as a standards-based reform tool that requires teachers to become intimately familiar both with state standards and with the performance level descriptors used on high-stakes assessments.

Districts can choose to use SBPRs to provide an alternative measure of standards attainment that when coupled with state test scores, provides an excellent measure of student achievement for the year. The value of SBPR grades, however, lies in the information provided about student performance that state test scores do not capture: attainment of skills at different points in the school year, performance on tasks that require students to more deeply explore a skill, and the ability to demonstrate knowledge in ways that paper and pencil tests cannot address (Guskey, 2013). The current study allows for those factors to be addressed by using a SBPR that shows mastery attained for each standard and allows parents to work with students to help them achieve mastery of those standards in which they are struggling.

There are several challenges to the SBPR that extend beyond teachers' use of nonacademic factors in grading. First, large-scale assessments may not adequately capture student attainment of the standards. The alignment between standards and assessments in 19 states was examined, and the study found that only about half of test items addressed state standards (Polikoff, Porter, & Smithson, 2011). In this study, only about half of the standards were included on the average test.

The second challenge to the SBPR is that teachers can have a difficult time interpreting the goal of specific state standards and teach the standards incorrectly or ineffectively. Guskey (2013) concluded that teachers interpreted the same objective quite differently and experienced difficulty in coming to consensus about what is intended by standards documents. For this reason, a standardized quiz for the specific standards being assessed will be used. The questions

on the quiz will have attached standards and the results at the end will show how each student performed on each standard. D'Agostino, Welsh, and Corson (2007) confirmed this theory by examining the degree of alignment between operationalization of state mathematics standards on a state test and in classrooms. They used degree of alignment to predict mathematics performance and found that teachers varied in the ways that they implemented the standards and that the degree of alignment predicted student achievement.

Third, the grading practices teachers use may jeopardize the reliability of grades and therefore weaken the link between grades and academic achievement. Using old grading mindsets, teachers may inflate grades with non-academic extra credit assignments, base grades on improvement instead of mastery, or incorporate formative assessments into summative scores, all of which are unrelated to how much a student knows and can do at the end of a grading period (Hartnell, 2016; McMillan & Schumacher, 2009).

SBPRs are very useful when these three points are addressed. If short, direct assessments are used that adequately fit the standards, the standards are correctly interpreted and taught, and grading comes from mastery of the standards, a grade card is useful for regular communication with parents. When using SBPRs, it is important to identify grading practices that are likely to yield SBPR descriptions that are consistent with state test results.

Guskey (2015) discussed the four main steps that must be taken to produce accurate SBPRs. First, the learning goals that guide what students must know and do must be defined. These goals are articulated within a set of district or state academic standards. Second, the student performance indicators of each goal must be stated. To accomplish this, teachers must figure out which tasks and activities will best reveal each student's progress in meeting the goals. Third, there is a requirement that teachers define graduated steps of performance that indicate a

student's development on multiple performance levels. The teacher must consider the different degrees of student performance on the indicators and define the dividing line between each level of achievement. Finally, the actual SBPR format must be created to communicate the results efficiently and effectively to parents and students. This is obviously a very challenging process, one that requires teachers to interpret and teach what can be vague standards in a way that is consistent with the intentions of the creators of these standards.

Determining student performance levels also requires a common thread of understanding of behaviors associated with each level, a task made more difficult because of ambiguous state performance level definitions. Therefore, it is unlikely that teachers similarly conceptualize attainment of state standards or that they use a completely consistent approach in assigning SBPR grades.

The promise of SBPRs to offer detailed descriptions of student mastery outweighs any of the aforementioned challenges (Guskey, 2013). SBPRs present an opportunity to combine test scores with multiple measures of student performance in a scale that is similar to that of the state test.

Summary

The importance of students' understanding of the goals, the relationship with the parents, and the desires of the teacher cannot be understated. As mentioned above, the standards-based movement in K-12 education has been under way for a while, but standards-based classroom grading is an area that requires more study. While it may be true that content standards and standards-based assessments have improved the rigor and uniformity of curriculum and instruction, grades and grading remain subjective. This subjectivity in grades leads to a large range of discrepancy between making an A and truly mastering the standards. This is

particularly true at the secondary level of education. Seiling (2013) stated that standards-based report cards may have become commonplace at the elementary level, but at the secondary level, report cards look pretty much as they did when the Committee of Ten convened in 1892 to consider high school reform. Letter grades (A-F) designate relative levels of student performance, and students' grade point averages (GPA) are computed on a 4-point scale (Seiling 2013).

Not only are standards-based grades not fully integrated into middle and high schools across the country, they are barely being talked about as an option. There are, however, several reasons for using standards-based assessments and standards-based grading in the classroom. First, teachers need to make sure that they are using the best possible method to assess their students for concept mastery. If educators do not use the right tools and take the time to analyze the assessment, they will not allow the assessment to properly drive instruction. To help each student, and not just as a part of a corporate gathering, teachers must take the time to properly prepare and analyze the assessments so that instruction can be driven effectively and efficiently.

Another reason for using SBPRs is to allow every piece of student work to attain meaning. SBPRs allow teachers to identify areas of weakness in students' knowledge of the standards and allow teachers to help the students correct those specific areas. Spencer (2012) pointed out that standards-based grading enables teachers to get the most from every piece of paper that students turn in. Writing feedback only on selected homework problems saves time when marking papers while also giving teachers a sense of where students are in their learning. These homework assignments and other formative assessments help teachers judge the progress of the group as a whole as well as individually before deciding how to proceed instructionally.

The literature shows that the change to standards-based assessments plus traditional grading is the most effective way to meet the needs of the students (Guskey, 2015; Seiling, 2013). In middle school classrooms across the United States, regular instruction, which includes lecture and practice worksheets, is still the predominate form of instruction. While standards have taken over in classrooms, the assessments and specifically SBPRs are still not being used to inform parents effectively about the mastery that their children are achieving (Cox, 2011). There is also not enough frequency in the reports that parents receive about the standards-based achievement of their children if progress reports are sent home only every four weeks. Educational stakeholders need to improve the relationship and communication with parents to help students achieve at the highest academic levels. This study attempts to improve the communication with parents regarding the mastery of standards and allow parents to become a more involved part of each student's educational success. By using standard-focused assessments and incorporating these results into a SBPR that is sent home weekly, it may be shown that student achievement will increase.

CHAPTER THREE: METHODS

Overview

Seiling (2013) and Cox (2011) discussed the importance of understanding the mastery level of each student, and Cox (2011) discussed the importance of keeping parents informed of a student's progress. It is important to find out if communication between teacher and parent regarding a student's mastery of science standards will increase student achievement. The researcher gathered data to determine whether the communication of the mastery of science standards with parents will allow students to be more successful and add information to fill this gap in the literature. According to Gall, Gall, and Borg (2010), using a posttest only, randomized-cluster design will allow for an accurate compilation of scores for groups of students on the posttest portions of the experiment. A *t*-test was used to compare the academic achievement of the treatment students to that of the control. The histograms from the *t*-test results showed a skewed curve. Due to the violation of assumption of normality, a Mann-Whitney test was run in addition to the *t*-test. Through measuring each student's mastery of the standards and communicating the mastery as well as areas of need to the parents, this researcher endeavored to find whether greater academic success was attained.

Design

A quantitative, quasi-experimental cluster-randomized control trial was used to examine whether the communication to parents of grades on weekly SBPRs can affect the achievement in science of seventh and eighth graders in one small rural Georgia middle school. According to Gall et al. (2010), using a posttest, randomized-cluster design allowed for an accurate compilation of scores for groups of students on the posttest in this experiment. The use of a randomized-cluster design gave a more accurate set of data while minimizing the effect of

outliers. The design included a cluster randomized control trial where the classes were randomly assigned to control groups and treatment groups. The control and treatment groups were taught using lecture, lab activities, and other hands on activities. All students were given a weekly quiz (see Appendices A, B, and C), and the mastery charts (see Appendix D) were updated after each quiz. The mastery chart is a document that shows the standards at the top and gives a corresponding percentage and a color code to show how well the student has mastered each standard. For this experiment, only the standards that were used for the study were on the mastery chart. Only the treatment groups were able to take home the updated mastery chart using the weekly SBPR. Although both groups were taught in the same fashion, the treatment group was the only group whose parents received a weekly SBPR and a corresponding piece of homework as an avenue for the parents to work with their child. This homework corresponded with the lowest standard or the standard that needed extra work before it was mastered. The posttest was administered to both control groups and treatment groups to measure the difference in scores made by each group of students (see Appendix E).

Standards-based grades from weekly quizzes were analyzed to determine how well each student is mastering each of the standards. This mastery information was provided by the SBPR (see Appendix F) to parents on a weekly basis to allow them to have timely information on the level of mastery that their child had on each specific science standard. The use of the SBPR as a communication tool for parents served as the independent variable, while the academic achievement of the students was measured as the dependent variable.

The impact of the SBPR on academic achievement was determined by measuring the difference on the posttest scores between the control group and the treatment group. According to Gall et al. (2010), a Likert-style system is considered an accurate way to measure and show

the levels of student learning and was used in this study to provide the results seen on the SBPR, showing whether an SBPR provides an effective means of communication of the measure of a student's academic success. The purpose of this study was to examine whether the communication between teachers and parents regarding SBPRs would allow parents to help their children achieve more standard mastery. By receiving an update of the mastery of standards and by understanding which standards their child is mastering and struggling with, it was this researcher's hope that parents would work with their students in a focused way and that extra work would help students show improvement in each student's lowest standards. By working on the lowest standard, the overall set of standards for that timeframe should mostly improve because of the chance for the lowest standard to change over time, thus, giving the parents an opportunity to help their children with more than one standard in some cases.

The purposes of this chapter are to describe the: (a) sample population (participants) selected for this study; (b) instruments that were used for data collection; (c) methods, materials, and procedures used to collect the data for the study; and (d) selection and use of statistical procedures employed in the analysis of the collected data.

Research Question

RQ1: Is there a significant difference between the mean scores on a middle school science unit posttest of students whose parents received weekly standards-based progress reports and the students whose parents did not receive weekly standards-based progress reports?

Null Hypotheses

$H_0$1: There is no significant difference between the achievement scores of seventh-grade students in an experimental group with weekly standards-based parental communication and

those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest.

$H_0$2: There is no significant difference between the achievement scores of eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest.

$H_0$3: There is no significant difference between the achievement scores of seventh-grade students in an experimental group with weekly standards-based parental communication and those of the eighth-grade students in an experimental group whose parents receive that communication, as indicated by a given science unit posttest.

Participants and Setting

The participants for this study included 4 seventh-grade classes and 4 eighth-grade classes in one Georgia middle school. Parents of both grade levels were also included. Four science teachers participated in this study. While this researcher is a teacher at this school, none of the tested subjects were from the researcher's own classes. Other teachers and their classes were the focus of this study.

Each of the eight classes were randomly placed into a control group or treatment group. Four were in the control group and four were in the treatment group. While the cluster groups were randomly assigned, they were formed naturally as classes. The seventh-grade group was comprised of 68% Caucasian, 31% Hispanic, and less than 1% African-American students. The eighth-grade group was comprised of 69% Caucasian, 30% Hispanic, and 1% African-American students. This was representative of the area in which the study was completed. This study included approximately 129 students (61 males and 68 females) in the treatment group as well as

approximately 133 students (60 males and 73 females) in the control group. According to a power analysis run using GPower for a *t*-test on the difference between two independent means (two groups), 102 subjects (51 in each group) is required. This total is found given a Cohen's *d* of 0.5, err probability of 0.05, and an expected power of 0.8. This meant that 262 subjects of 129 in the treatment group and 133 in the group was sufficient to identify the effect size in this study. The minimum detectable effect size for this study was .32.

The setting of this research was a small middle school in Georgia. The middle school had over 500 students in the seventh and eighth grades combined. As mentioned earlier, this researcher's students were not a part of this study. This left approximately 400 students that could be a part of the study. This study was conducted in a rural setting which is also considered a low SES area (85% on free and reduced lunch). The primary settings were science classes in this rural middle school. The community was very reliant on farming and the flooring industry and had been hit hard by the economic downturn. As a result, many parents commuted to surrounding counties for employment and many students were left to work on their own classwork. Parents need to be able to use their time wisely with their children, so a guide such as the SBPR along with study guides and resources should be helpful in allowing parents to work with their children effectively and efficiently.

The sampling procedure chosen for this study was a cluster sampling of the students. The clusters automatically formed every year when classes were created. Each grade used a group of students divided into four clusters (classes) that formed the control and treatment groups. These groups were chosen as control or treatment from a random drawing by an otherwise uninvolved person who did not know for what she was drawing.

Instrumentation

The summative instruments (posttests) were originally created using Achievement Series to show growth in a set of standards over a six-week period of time. Achievement Series has been the school district's benchmarking system. The Achievement Series benchmark tests were developed and have been used by the school district for six years (2010-2016). These benchmarks were used in the county annually to track achievement on specific standards. Formative quizzes were administered each week to track the students' growth and to drive the SBPRs. These quizzes were designed by the teachers in the school district, have been closely aligned to the standards, and have been used in science classrooms across the district.

Each formative quiz was 20 questions long, with an evenly divided number of questions for each standard. No reverse questions were used in these quizzes. Each multiple-choice quiz was worth 100 points, and each standard was calculated at 100 points for the achievement percentage. This means that a student earned an overall score on the quiz and had a breakdown score for each standard tested. So, a student could earn an overall score of 90% (A) but have a standard within the quiz that was not mastered (Standard C- 50%). The Likert scale was meant to approximate the levels of achievement for each standard on the Milestones test in Georgia. To emulate this scale, the levels of mastery were calculated to be Does Not Meet (Below 60%), Improved but Does Not Meet (Below 60%, but higher than before), On the Bubble (60%-69.9%), Meets (70%-79.9%), or Exceeds (80%+). Students were given up to 60 minutes to take the quiz. The results were tallied overall and by standard. The test was scored at the completion of the quiz. The scores were calculated by standard to calculate the percentage that the student answered correctly for each standard.

The Benchmark posttest was 32 questions long and was also divided across the five standards being evaluated. No reverse questions were used in these quizzes. The benchmark posttest was worth 100 points and each standard was calculated at 100% for the achievement percentage. The Likert scale was meant to approximate the levels of achievement for the Milestones test in Georgia. To emulate this scale, the levels were calculated to be Does Not Meet (Below 60%), Improved but Does Not Meet (Below 60%, but higher than before), On the Bubble (60%-69.9%), Meets (70%-79.9%), or Exceeds (80%+). Students were given the exam online. Students were given 60 minutes to complete the test and the results were tallied overall and by standard. The test was scored with an answer key from the Achievement Series benchmark. The questions were also checked by standard to calculate the percentage that the student marked correctly for each standard.

The posttest had questions that were similar to the quizzes, but since they were not exactly the same, just related to the standard, threats to validity should be minimized. To calculate reliability, a Split-Half Reliability test was used to evaluate the results of the posttest from the previous year.

The benchmark assessment was analyzed using the Split-Half Reliability test. The Split-Half Reliability test assumes that if a test is reliable, students will score fairly evenly on both halves of the test. The 30 random samples for each assessment were taken from last year's assessment pilot. Therefore, each test of 30 questions was analyzed by breaking the test into odd and even questions to test the reliability using the Split-Half Reliability test. In this model, each half of the test was graded and compared against the other to determine the reliability (accuracy) of the test. The reliability was .90151 and the Pearson Product Moment Correlation was 0.820681. Since any number above 0.80 is considered good, this test had an adequate reliability.

Procedures

After receiving approval from the school district (see Appendix G), the principal (see Appendix H), and Liberty University Institutional Review Board approval (see Appendix I), approval from parents and students was requested and received (see Appendices J and K). After the approvals were collected, the experiment was implemented. Two teachers from each grade had random classes assigned to receive SBPRs and random classes that did not receive the SBPRs to communicate with parents. There were a total of 4 seventh-grade classrooms that used SBPRs and 4 that did not. This was the same for eighth grade.

Students in all classes were taught in the same way with lessons (mostly PowerPoint and Smart Board interactive lessons), hands-on investigation (lab experiments), and practice work. At the end of each week, there was a formative quiz to identify the achievement of the student. The treatment group students received an updated SBPR to take home to his or her parents. This SBPR included study guides and homework (see Appendices L, M, N, and O). At the end of the five-week period, a posttest was taken to determine the academic achievement of each student and each group. A *t*-test was used to determine the *p* value (the difference between means of two groups). Once these tests were completed, the statistical significance was determined, and each null hypothesis was rejected or failed to be rejected. Finally, the results were recorded and the findings were compared to the literature and aid in the discussion of the assumptions, limitations, and recommendations for future research.

Data Analysis

An independent *t*-test for each of the null hypotheses (showing the differences in the means) was conducted. A t-test was run between the seventh-grade control and treatment groups, between the eighth-grade control and treatment groups, and between the seventh-grade

and eighth-grade treatment groups. Descriptive statistics for measures of central tendency were used to ascertain the means of each group for each grade using a *t*-test. The significance was set at .05 and at a power of .80, which is recommended by Cohen (1988).

The *t*-test was used to analyze the comparison between the independent variable and the dependent variable (Howell, 2007). The *p* value was calculated to determine whether the researcher would reject or fail to reject the null hypothesis. Cohen's *d* was used to measure the effect size for the independent *t*-test to express the difference between the means of the two groups in terms of the size of the standard deviation (Rovai, Baker, & Ponton, 2013). The idea of using a one-way analysis of variance (ANOVA) was entertained, but Gall et al. (2010) stated that for the analysis of two groups, the ANOVA and t-test give identical results.

CHAPTER FOUR: FINDINGS

Overview

Chapter Four contains a detailed data analysis for this study, a restatement of the purpose of the study, research question, and the hypotheses. The purpose of this quantitative, cluster-randomized control group study was to examine whether identifying and communicating the academic achievement of students to parents by use of SBPRs would help students improve their academic achievement. This study looked at the difference in means between the scores on a middle school science unit posttest of students whose parents received additional communication in the form of SBPR and the scores on that same middle school science unit posttest of students whose parents did not receive the additional information. A secondary goal was to ascertain whether the use of standards-based grading, including each standard taught along with a mastery statement for each standard range, would encourage higher academic achievement in middle school science classes by combining parental involvement with test score analysis. The independent variable for this study was the communication of standard mastery information using the SBPR. The dependent variable for this study was the level of academic achievement that was accomplished by each student, as determined by their end of quarter posttest. The results of this study should help teachers understand whether standards-based grading communicated to parents could help students achieve more academic success in middle school science classes. This study may also potentially show how consistent communication between teachers and parents can increase student engagement and understanding of where students are and what they need to do to reach mastery of each standard. The research question and hypotheses for this study are identified below.

Research Question

RQ1: Is there a significant difference between the mean scores on a middle school science unit posttest of students whose parents receive weekly standards-based progress reports and the students whose parents do not receive weekly standards-based progress reports?

Null Hypotheses

$H_0$1: There is no significant difference between the achievement scores of seventh-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest.

$H_0$2: There is no significant difference between the achievement scores of eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest.

$H_0$3: There is no significant difference between the achievement scores of seventh- and eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control groups whose parents do not receive that communication, as indicated by a given science unit posttest.

Descriptive Statistics

At the beginning of the analysis, the researcher analyzed descriptive statistics for seventh grade scores individually (treatment and control), eighth grade scores individually (treatment and control), and seventh- and eighth-grade combined scores (treatment and control). There was a significant difference in the scores for the seventh-grade treatment group ($M = 84.19$, $SD = 10.93$) and those for the seventh-grade control group ($M = 78.49$, $SD = 13.74$); $t(122) = 2.56$, $p =$

0.012. There was a significant difference in the scores for the eighth-grade treatment group (M = 81.21, SD = 14.34) and those for the eighth-grade control group (M = 74.94, SD = 16.38); t(136) = 2.38, p = .019. There was a significant difference in the scores for the combined seventh-and eighth-grade treatment group (M = 82.67, SD = 12.83) and those for the control group (M = 76.57, SD = 15.27); t(260) = 3.49, p = .001. Boxplots indicated one or two outliers in Figure 1, but these could be reasonably explained by naturally occurring variation in the scores of different students.

Table 1

Descriptive Statistics for the Seventh-Grade Treatment and Control Groups

	N	*M*	*SD*	SE Mean
Treatment	63	84.191	10.929	1.377
Control	61	78.492	13.744	1.760

Table 2

Descriptive Statistics for the Eighth-Grade Treatment and Control Groups

	N	*M*	*SD*	SE Mean
Treatment	66	81.212	14.345	1.766
Control	72	74.944	16.376	1.930

Table 3

Descriptive Statistics for the Combined Seventh- and Eighth-Grade Treatment and Control Groups

	N	*M*	*SD*	SE Mean
Treatment	129	82.667	12.829	1.130
Control	133	76.571	15.272	1.324

Results

Assumption Tests

The boxplots indicated that there were outliers in all three samples and the histograms showed a skewed distribution. While the boxplots showed very few outliers, those were kept as a part of the results because they represent individual test scores that can happen in any educational setting. The boxplot outliers were not from an error and were not extreme outliers, so they were kept as part of the data set. The histrograms did show a skewed distribution so a Mann-Whitney test was run in addition to the *t*-test. The Levene's test results that were returned indicated that equality of variance could be assumed in each case ($p > .05$).

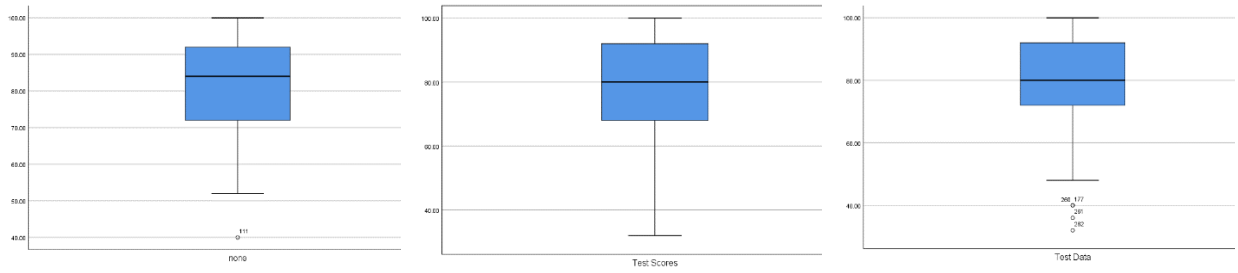


Figure 1. Boxplots of seventh- and eighth-grade scores (left to right: Seventh Grade, Eighth Grade, and Combined Seventh Grade and Eighth Grade).

Table 4

Levene's Test Results

		F	Sig.
Seventh Grade Treatment and Control	Equal variances assumed	3.753	.055
	Equal variances not assumed		
Eighth Grade Treatment and Control	Equal variances assumed	.704	.403
	Equal variances not assumed		
Seventh and Eighth Grade Treatment and Control	Equal variances assumed	3.266	.072
	Equal variances not assumed		

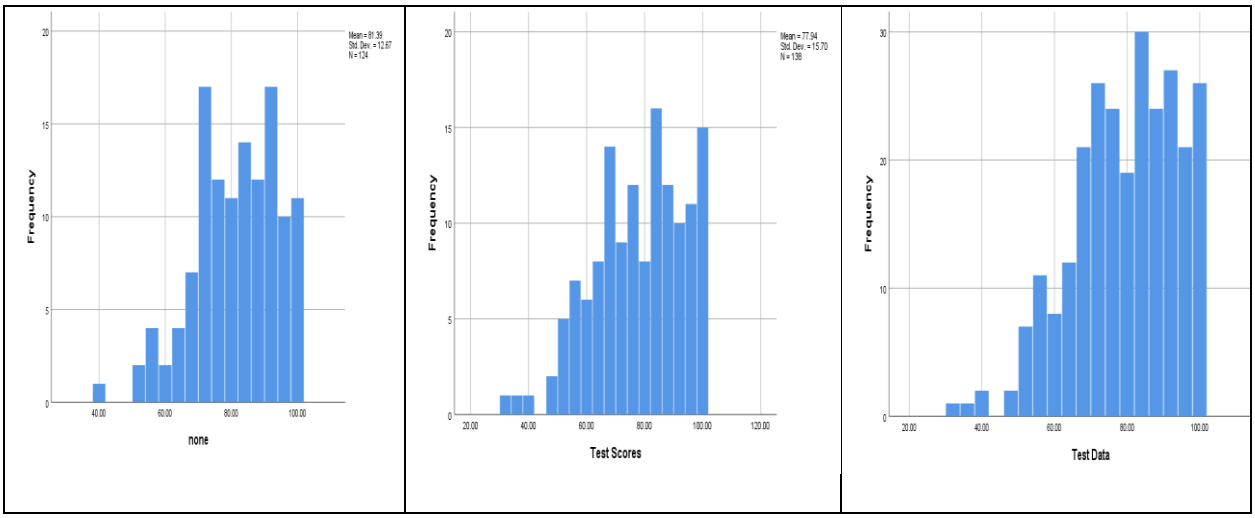
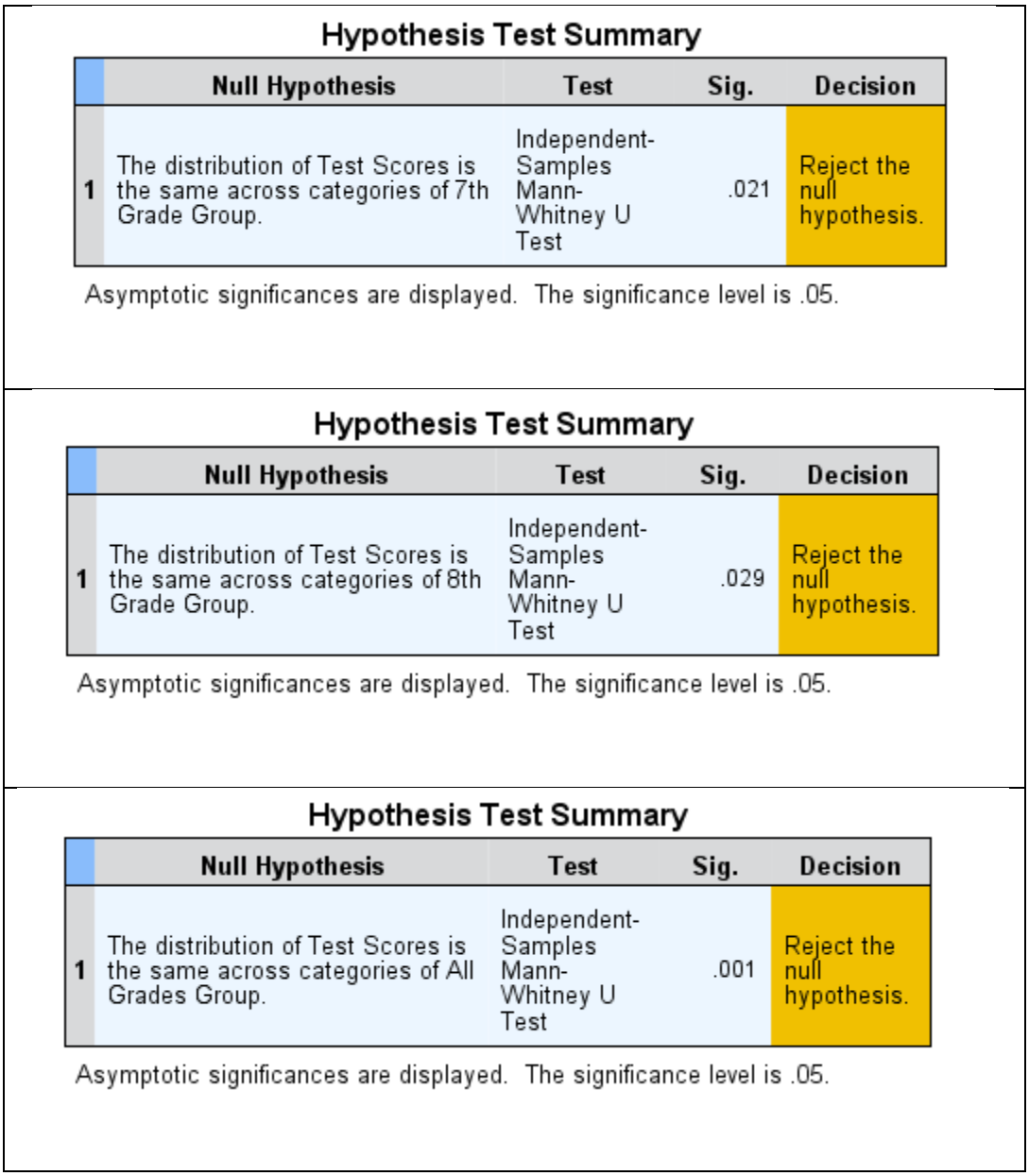


Figure 2. Histograms of treatment and control groups (left to right: Seventh Grade, Eighth Grade, and Combined Seventh Grade and Eighth Grade).



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Test Scores is the same across categories of 7th Grade Group.	Independent-Samples Mann-Whitney U Test	.021	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Test Scores is the same across categories of 8th Grade Group.	Independent-Samples Mann-Whitney U Test	.029	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Test Scores is the same across categories of All Grades Group.	Independent-Samples Mann-Whitney U Test	.001	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 3. Mann U Whitney Test results of treatment and control groups (top to bottom: Seventh Grade, Eighth Grade, and Combined Seventh Grade and Eighth Grade).

Hypotheses

Null Hypothesis One

The null hypothesis stated that there would be no significant difference between the achievement scores of seventh-grade students in an experimental group with weekly standards-

based parental communication and those of the control group whose parents would not receive that communication, as indicated by a given science unit posttest.

The *t*-test showed a significant difference in the posttest scores for the seventh-grade treatment group (M = 84.19, SD = 10.93) and those for the seventh-grade control group (M = 78.49, SD = 13.74); t(122) =2.56, p =0.012. The effect size was medium (*d* = 0.46). Therefore, the null hypothesis was rejected at the alpha level of .05.

For $H_0$1, the histogram returned an abnormally shaped curve due to the higher number of A scores on the posttest. The assumption of normality was not tenable. Due to this violation of the assumption of normality, a Mann-Whitney test was run in addition to the t-test.

The Mann-Whitney test indicated that the post-test scores for the seventh-grade treatment group were higher (Mdn = 84) than those for the seventh-grade control group (Mdn = 80), U= 1461.5, p =0.021 . The Mann-Whitney Test showed sufficient results to reject the null hypothesis.

Null Hypothesis Two

The null hypothesis stated that there would be no significant difference between the achievement scores of eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents did not receive that communication, as indicated by a given science unit posttest.

The two-tailed t-test to determine the higher test score mean returned p = .019. There was a significant difference between the posttest scores of students from the treatment group (M = 81.21, SD = 14.34) scored significantly higher than students from the control group (*M* = 74.94, SD = 16.38); t(136) =2.38, p =.019. The effect size was medium (*d* = 0.41).

For $H_0$2, the histogram returned an abnormally shaped curve due to the higher number of As on the posttest. The assumption of normality was not tenable. Due to this violation of the assumption of normality, a Mann-Whitney test was run in addition to the t-test.

A Mann-Whitney test indicated that the post-test scores for the eighth-grade treatment group were higher (Mdn = 84) than those for the eighth-grade control group (Mdn = 76), U=1864.5, p =0.029. The Mann U-Whitney Test showed sufficient results to reject the null hypothesis.

Null Hypothesis Three

The null hypothesis states that there is no significant difference between the combined achievement scores of seventh- and eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control groups whose parents do not receive that communication, as indicated by a given science unit posttest.

The two-tailed t-test to determine the higher test score mean returned p = .001. There was a significant difference between the posttest scores of students from the treatment group (M = 82.67, SD = 12.83) scored significantly higher than students from the control group (*M* = 76.57, SD = 15.27); t(260) =3.49, p =.001. The effect size was medium (*d* = 0.43).

For $H_0$3, the histogram returned an abnormally shaped curve due to the higher number of As on the posttest. The assumption of normality was not tenable. Due to this violation of the assumption of normality, a Mann-Whitney test was run in addition to the t-test.

A Mann-Whitney test indicated that the post-test scores for the seventh-and eighth-grade treatment group were higher (Mdn = 84) than those for the seventh-and eighth-grade control group (Mdn = 76), U=6630.5, p =.001. The Mann-Whitney Test showed sufficient results to reject the null hypothesis.

Together, the data from the t-tests and the Mann-Whitney tests show that there is sufficient evidence to reject the null hypothesis and conclude that there is a significant difference between the achievement scores of seventh- and eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control groups whose parents did not receive that communication.

CHAPTER FIVE: CONCLUSION

Overview

This research study investigated the achievement of middle school students, using a different style of parent communication, a standards-based progress report. This chapter provides a concise summary of the findings as well as a discussion, implications, limitations, summary, and recommendations for future research.

Discussion

The purpose of this quantitative, cluster-randomized control group study was to examine whether identifying and communicating the academic achievement of students to parents by use of SBPRs would help students improve their academic achievement. A statistically significant difference was found after analyzing the data. This indicated the independent variable of communicating standards-based mastery with parents positively affected the dependent variable of posttest mean scores. This data shows that when used consistently, a SBPR is a tool that could increase science achievement in middle school students by improving communication between the teacher and the parents. One study that was completed in the Galesburg, Illinois school system found mixed results from their efforts to replace a standard report card with a rubric to show standards that were met, exceeded, and failed; however, the education of the parents was lacking and this led to a low level of understanding by the parents as to how the report card rubric should be read (Cherniss, 2008). This led to a mixed effectiveness that did not match the desired effect of the standards-based report card. This study illustrates the importance of clear and effective communication with parents. In this district's effort to enhance the grade-based communication with parents, effective instructional communication was needed so the

new information would be effective to share the standard mastery achieved by each student. Without the educational communication or clear instructions on how to read the rubric, the standards-based portion of the report card was not an effective communication tool. In contrast to this previous study, the results of this project do align with the work done by Seiling (2013) using standards-based report cards. A big difference between the use of SBPRs and that of standards-based report cards is the frequency at which the SBRPs are sent home. The SBPR report is a bi-monthly or weekly report where the standards-based report card is a quarterly report, often sent home every eight weeks.

As stated earlier by Patrick (2015), parent communication has been known to be an effective tool for increasing academic achievement. As standards evolve and change, the way teachers communicate with parents must change to keep effective communication between stakeholders and to ensure the best opportunity for students to maximize their time in school. Desilver (2015) pointed out that while the information that is received from test scores is very important, this information should not be the sole information for making important educational decisions because test scores do not provide all of the critical information for making these decisions. They are only a part of the picture for a student.

Null Hypothesis One

The null hypothesis states that there is no significant difference between the achievement scores of seventh-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest. The students whose parents participated in the treatment group scored higher on the final posttest as a group than those students in the control group whose parents did not receive the communication found on the SBPR. The difference was

found to be statistically significant; therefore, there was enough evidence to reject the null hypothesis.

Null Hypothesis Two

The null hypothesis states that there is no significant difference between the achievement scores of eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest. The students whose parents participated in the treatment group scored higher on the final posttest as a group than those students in the control group whose parents did not receive the communication found on the SBPR. The difference was found to be statistically significant; therefore, there was enough evidence to reject the null hypothesis.

Null Hypothesis Three

The null hypothesis states that there is no significant difference between the achievement scores of seventh- and eighth-grade students in an experimental group with weekly standards-based parental communication and those of the control group whose parents do not receive that communication, as indicated by a given science unit posttest. The students whose parents participated in the treatment group scored higher on the final posttest as a group than those students in the control group whose parents did not receive the communication found on the SBPR. The difference was found to be statistically significant; therefore, there was enough evidence to reject the null hypothesis.

This difference in posttest scores between the treatment group and the control group was seen to be positively significant in all three groups. These positive outcomes experienced by the seventh-grade treatment group, eighth-grade treatment group, and combined seventh- and eighth-

grade treatment group agree with Guskey (2013) that showed that the SBPR can be an effective tool to communicate with parents in a more specific and useful manner. This study also aligns with studies by Seiling (2013), Spencer (2012), and Patrick (2015) that showed the effectiveness of a standards-based report card in conveying the mastery of specific standards instead of an overall subjective grade standing on its own. This study found that, along with the results of these preceding studies, that a SBPR can effectively communicate the mastery of standards to show the standards that are mastered as well as those that need remediation. In a like manner, the SBPR again confirms Vygotsky's (1978) theory about identifying the level of functioning for a student, record that level, and help them reach the next level through scaffolding. This point may be coupled with the social constructivist theory that children learn through various social interactions, including interactions with parents (Wood et al., 1976). As Chen and Bonner (2016) intimated, proper communication with parents can be the bridge to help meet specific goals. In this study, the data supports Chen's and Bonner's point about communication by showing that the use of a SBPR to communicate more specifically with parents can positively impact academic achievement for students.

Implications

Realizing that high stakes testing continues to be a driving force for school districts to become more accountable for the educational achievement of its students, parent communication is even more important (Patrick, 2015). The clearly significant evidence, as provided by this study, indicated that the SBPR can be used to improve the academic achievement of students in science.

Teacher participation was extremely important for this study. Because students spend the majority of their time during the school year with teachers, the communication between teachers

and parents is of high importance. With science being one of the five main areas in education, teachers must continue to discover new ways to communicate in science, along with possibly other core areas like math and reading. Multiple styles of assessments and test results can be combined into the SBPR to guide teachers on where to spend more time remediating individually and by class and show parents which areas need attention at home. This SBPR shows the potential to improve the daily work environment for teachers by helping teachers guide more students to a higher level of mastery by communicating the mastery of individual standards with parents. This study shows that there may be a significant improvement in the achievement of middle school students when a SBPR is used.

There is an area of concern with the SBPR and that is the time that it takes to keep up with the changes in mastery for the students in a teacher's class. This process can be time consuming. The SBPR can also guide the teacher to break the class into small groups for remediation purposes and this can require more lesson planning. However, planning ahead and stockpiling lessons, practice assignments, open-ended questions, and little open-group assessments can take away some of the time consumption. Guskey (2013) stated that the promise of SBPRs to offer detailed descriptions of student mastery outweighs any of the aforementioned challenges. As previously mentioned, SBPRs present an opportunity to combine test scores with multiple measures of student performance in a scale that is similar to that of the state test. To this point, compiling the data from quizzes and other assessments with other pieces of information into an SBPR for parents can be a very effective tool to help students achieve higher academic success. This study addresses the gap in the literature by showing how the use of the SBPR to communicate with parents specifically which science standards are being

mastered and which are not. This study helps to show how effective this specific communication can be to help more students achieve higher academic success.

Limitations

This dissertation came from a desire to provide more accurate, focused feedback to parents in a way that could enhance the communication between parents and teachers and result in a higher level of academic achievement for middle school students in science and possibly other areas. While the study showed evidence to reject all three null hypotheses, there were several limitations that affected this study.

First, one weakness of this study was that it was not as extensive as it could have been. Only a little over half of one school participated in the study which may have skewed the results. While there were enough students involved in the study to complete it satisfactorily and reject the null hypotheses, the number of students that participated compared to the number of students that could possibly have participated could have impacted the results. This could affect the study because the full complement of students in a school or class gives a more varied sample size and while there is no knowledge that this affected the study, having a larger number of students that did not participate could have affected this particular study. This also meant that the results cannot be generalized beyond this population. One area where this could be is in the higher-grade average than would normally be expected. With means in the high 70% to low 80% range, the number of students could have impacted the means of the groups. While students did not know which of the two groups they would be assigned to when the permission letters were sent home, the parents who signed up may have been ones who were naturally more involved with their students' success and saw this study as an opportunity to help their students increase academic achievement.

A related, additional weakness in this study was the timing of the study. The study took place at the end of the school year, most of which was completed after the end-of-year state testing. This time of the year is typically a winding down time for students, teachers, and schools. While this particular school tested later in the year than most schools did, the last few weeks of the testing occurred after the testing had finished. This could have impacted some of the students' achievement scores by decreasing their motivation toward the end of the testing period.

The generalization of this study could be limited by the sample population as it might not have been completely representative of a school's full population. The power of the study was fine, but the results may not be able to be generalized to other school populations. Also, this study was limited to one rural middle school in the southeastern United States. The location of this school would not compare to the entire population of the United States so the diversity of this study would be another limiting factor.

There were multiple threats to validity. First, history could have been a threat to the validity of this study. Since this posttest was completed at the end of the school year, the students would have seen questions that are similar to those that were on the test. Even though the questions were not the same, familiarity may have resulted in higher scores than in a normal eight weeks. Secondly, population selection could have been a threat to the internal validity of this study (Gall et al., 2010). While all students had an equal opportunity to participate, the end of the school year may have allowed some students to opt out of the testing or talk their parents out of testing when they would have been a part of the test earlier in the year. This could have skewed the results of this study.

Lastly, design contamination could have been a threat to internal validity. Since some students received a SBPR to take home and others did not, there is the real chance that the students in the groups knew that the difference existed. This could have influenced one group or the other to work harder to beat the other group of students (Gall et al., 2010).

There were likewise threats to the external validity of this study. First, the population may not represent other populations inside or outside of this community. While this population sample did represent the overall population of the school, it may not necessarily represent the population of the school in the years to come or other populations outside of this community. Secondly, the population may have performed differently because they knew they were part of this study. According to Gall et al. (2010), this phenomenon is called the Hawthorne Effect and it could have acted as an external threat to this particular study because the students in the study were not taught by the researcher, but they knew the researcher and that could have affected the study's results.

Recommendations for Further Study

The scores on the posttest showed a statistically significant impact on the achievement of middle school students in one unit in science. This showed that the SBPR can be an effective tool to increase academic achievement in science at the middle school level. One recommendation for further study would be pairing the first couple of SBPRs with a parent conference in person or remotely to discuss the progress report, give direction on ways it can be used, and to answer questions. Sometimes, opening the channels to a one-on-one format can be beneficial and reach parents that may not otherwise participate. It is also recommended that to help increase the validity of the research data, the study duration should be increased to encompass a larger portion of the school year, (i.e., a semester).

Another recommendation for further study would include the time between progress reports. While the progress report and report card frequencies tend to rotate every 4-4 ½ weeks, this study sent a progress report home every week. While the test results showed a statistically significant difference, could it be that every two weeks or three weeks would produce the same statistical difference? This aspect could be studied further.

Lastly, this population represented the school population fairly well, but there are many populations outside of this school that are significantly different in their diversity. As this study cannot be generalized across all of the populations, further study around other diversified populations is needed to add to this portion of the literature.

This study showed a statistically significant difference utilizing the SBPR. This study fills a portion of the gap in the literature by showing how the use of the SBPR to communicate with parents specifically which science standards are being mastered and which are not. This study helps to show how effective this specific communication can be to help more students achieve higher academic success. Even though this study helps to close the gap in understanding the effect of specific standards communication with parents using the SBPR, a continued effort is recommended to continue to improve academic achievement and test scores for students by accurately assessing academic achievement and remediating based on assessment based standard mastery.

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APPENDIX A: Chemistry Review Quiz One

(Used for assessment quizzes one and four)

Chemistry Review Quiz One

(This image was removed due to copyright)

1. The picture above represents which of the following?
   a. molecule b. element
   c. atom d. mixture
2. What charge does a neutron have?
   a. positive b. negative
   c. neutral d. magnificent
3. A chocolate milk is considered a/an
   a. like molecule b. heterogeneous mixture
   c. compound d. homogeneous mixture
4. Soil in the garden is considered a/an
   a. like molecule b. heterogeneous mixture
   c. compound d. homogeneous mixture
5. What state of matter is soil in the garden?
   a. solid b. liquid
   c. gas d. plasma
6. 

   (This image was removed due to copyright)

   Which of the following is the picture above an example of?
   a. solid b. liquid
   c. gas d. compound

7. Which process changes a gas to a liquid?

   a. boiling b. evaporation

   c. melting d. condensation

8. Which of the following is described when stating that dirty oil in your car looks black?

   a. physical property b. physical change

   c. chemical property d. chemical change

9. Joe found a substance that is black, can react with glass to form ooze, is becoming clear because he exposed the substance to carbon, and can be cut into cubes. Which of the following is the ability of the substance to form ooze when mixed with glass?

   a. physical property b. physical change

   c. chemical property d. chemical change

10. Melting rocks into molten lava is an example of a

    a. physical property b. physical change

    c. chemical property d. chemical change

11. What does the atomic number stand for?

    a. number of protons and neutrons in the nucleus b. number of electrons

    c. number of protons and electrons in the nucleus d. number of protons

12. Which element is most likely to react with Selenium?

    a. Sulfur b. Calcium

    c. Chlorine d. Lithium

13. Elements that are found to have similar properties usually are found in the same

    a. Period b. Family

    c. Row d. Group of metalloids

14. How many atoms of oxygen will be needed to make 10 molecules of H_2O?

    a. 3 b. 10

    b. .20 d. .30

15. The law of conservation of mass (matter) states that

    a. Nothing is created or destroyed, it is just recycled.

    b. A chemical reaction creates matter.

c. Every 100 years, some matter is destroyed.

d. What goes up, must come down.

16.

(This image was removed due to copyright)

The picture above represents which of the following?

a. molecule b. compound

c. atom d. mixture

17. A plastic bag full of Lucky Charms cereal is considered a/an

a. like molecule b. heterogeneous mixture

c. compound d. homogeneous mixture

18. When preparing a football field for a game, the grounds crew must mow the grass, repaint the lines, and moving any equipment needed on the field. This process can fall under which of the following categories?

a. Physical properties b. Physical Changes
c. Chemical properties d. Chemical Changes

19. Consider the following picture. There are two parts of an atom found in the nucleus of an atom. The nucleus is positively charged. If the protons are the positive parts of the atom, what charge do the other atomic parts in the nucleus possess?

a. Positive c. Neutral

b. Negative d. Not enough information

20. If 20 various atoms are used to make a given compound, how many atoms will there be total at the end of the compound's formation?

a. 20 atoms because the atoms split in two and half of them are destroyed.

b. 20 atoms because the law of conservation of matter states that matter is just transformed to different arrangements.

c. 40 atoms because the law of conservation of matter states that compounds create more matter.

d. 10 atoms because the law of conservation of matter states that in every reaction, half of the matter will be consumed and destroyed.

APPENDIX B: Chemistry Review Quiz Two

(Used for assessment quiz two)

Chemistry Review Quiz Two

1. If a pure substance is made of two or more different atoms,

   a. it is an atom. c. it is a heterogeneous mixture.
   b. it is an element. d. it is a compound.

2. Jimmy found this substance in a clear cup. When he looked more closely, he found that the cup contained a liquid that was orange with no visible pieces in it. He determined that this was a solution. Jimmy is

   a. correct because the liquid is clear.
   b. incorrect because the liquid is not clear.
   c. correct because solutions are always homogenous and cloudy.
   d. incorrect because solutions are heterogeneous and you can see the different particles.

3. If a marble is used by Mrs. Baggett to represent the smallest complete unit of an element, she is holding a model of a(n)

   a. atom c. compound
   b. molecule d. homogenous mixture

4. A substance that is cloudy and heterogeneous with visible pieces floating in it is called a(n)

   a. pure substance. c. colloid
   b. solution d. suspension

5. By definition, group made of more than one substance that is in the same relative space at the same time, but where each substance keep its own properties is called a(n)

   a. atom c. molecule
   b. mixture d. compound

6. Aaron is given a container of sugar water to study. When Aaron boils the sugar water for his last experiment of the day, he finds a white residue left in the container. Which of the following is the sugar water an example of?

   a. element c. mixture
   b. compound d. molecule

7. If an atom of Neon and two atoms of Nitrogen combine together chemically (a new substance with different properties), what will form?

   a. an atom c. a heterogeneous mixture
   b. compound d. a homogenous mixture

8. 

(This image was removed due to copyright)

Which term below best describes this substance?

a. atom c. molecule
b. element d. mixture

9. Purified water (H2O) is an example of a(n)

a. atom c. molecule
b. element d. mixture

10. Kool Aid is a popular drink for kids. It is a special combination of sugar, small colorful solids, and water that all mix together in a homogenous, cloudy drink. You cannot see through it, but you also cannot see the individual particles that form the drink. From the descriptors above, Kool Aid is a (n)

a. element c. solution
b. colloid d. suspension

11. The picture below is an example of a(n)

(This image was removed due to copyright)

a. atom c. element
b. compound d. mixture

12. Jamie is looking at a pure substance under a microscope. It is made of three of the same type of atom. The atoms are bonded together to form one molecule. What is the best way to describe this substance?

a. atom c. homogenous mixture
b. element d. compound

13. The picture below shows a substance that is liquid. The interesting part is how the liquid has chunks or pieces floating in it. I find that before I use this on my salad, I must shake it up because sometimes the pieces have settled to the bottom, what is this an example of?

(This image was removed due to copyright)

a. a solution
b. a colloid
c. a homogenous mixture
d. a suspension

14. A bowl of salad is considered a

a. compound.
b. molecule.
c. homogenous mixture.
d. heterogeneous mixture.

15. Looking at the picture below, which does not fit the definition of a solution?

(This image was removed due to copyright)

a. sugar water
b. salt water
c. sandy water
d. they are all solutions.

16. How many different elements are represented in the molecule below?

(This image was removed due to copyright)

a. one
b. three
c. two
d. four

17. How many atoms are represented in the molecule below?

(This image was removed due to copyright)

a. one c. two
b. three d. four

18. Coffee is a drink consumed by millions of people every day. In a clear glass, you will find that you cannot see through the coffee, but you also cannot see particles floating in a cup of black coffee. What is the proper classification of the cup of coffee below?

(This image was removed due to copyright)

a. Solution c. heterogeneous mixture
b. Colloid d. suspension

19. A bowl of chili is a(n)

a. compound. c. homogenous mixture.
b. element. d. heterogeneous mixture.

20. After a wonderful dinner on a cold day, your mother brings in a warm bowl of chocolate pudding. This wonderful treat is an example of a(n)

a. molecule. c. homogenous mixture.
b. compound. d. heterogeneous mixture.

APPENDIX C: Chemistry Review Quiz Three

(Used for assessment quiz three)

Chemistry Review Quiz Three

1. 

(This image was removed due to copyright)

The picture above represents a substance that is pure, not a mixture. This substance can be categorized as a(n)

a. atom c. element
b. compound d. air molecules

2. Hamburger helper is a delicious food that usually includes noodles, meat (hamburger), and powder. You are often asked to add butter and water when cooking the meal. This tasty dish that is pictured below is an example of a(n)

(This image was removed due to copyright)

a. pure substance c. homogeneous mixture
b. element d. heterogeneous mixture

3. A sheep's wool is grown out for clothing purposes. After the sheep's wool grows enough, it is sheared and the excess wool that the sheep doesn't need is sold to make clothing. The shearing of a sheep is an example of a

a. physical property c. physical change
b. chemical property d. chemical change

4. Franz is looking for a special state of matter. This state of matter has the ability to keep the same volume when placed in a different container. However, this same state of matter changes shape when placed in a different shaped container. What state of matter is Franz looking for?

   a. Solid c. gas
   c. Liquid d. plasma

5. Scientists have discovered many elements and placed them in a specific arrangement by atomic number on the periodic table. About how many elements have scientists discovered so far?

   a. 50 c. 115
   c. 90 d. 150

6. When Jules puts two liquid solutions together, the two substances combine to make something new. If 25 grams of substance A and 15 grams of substance B are added together, how many grams should the new substance weigh?

   A. 25 because some of the matter is destroyed in the reaction.
   B. 40 because new matter is created.
   C. 15 because of the destruction of 25 grams in the violent reaction.
   D. 40 because the same amount of matter that goes into a reaction must come out of the reaction.

7. Which of the following describes two or more atoms of the same substance combined together and held together in a pure substance?

   a. compound c. element
   b. mixture d. atom

8. Hot cocoa with marshmallows is considered a

   a. compound. c. heterogeneous mixture.
   b. molecule. d. homogenous mixture.

9. When lava is deep inside a volcano, it reaches very high temperature and bubbles in the lava form as gases escape the liquid magma. The process of gases forming from deep in the Earth below the surface is called

   a. condensation c. melting
   b. evaporation d. boiling

10. Kayci is washing her parent's SUV. She is earning money to spend on her spring break trip. There is a certain satisfaction that comes from watching the SUV change from brown to red as the mud comes off on the sponge. The change in color is considered a

   a. physical property c. chemical property
   b. physical property d. chemical change

11. Which of the following is the largest group of elements on the periodic table?

    a. metals c. metalloids
    b. nonmetals d. they are all the same

12. When Mentos candy is placed in coca cola, it fizzes. When the mass is measured, it is lower than the mass of Mentos and coke added together. What is the best reason for this difference in mass?

    a. Some of the matter is destroyed in the process.
    b. Some of the matter is created in the process.
    c. The measuring is completed incorrectly.
    d. Some of the mass left the container as gas (bubbles).

13. 

    (This image was removed due to copyright)

    In the picture above, there are pure substances in the same area at the same time. Which category below does the picture best fit in?

    a. A mixture of elements c. a pure substance (compounds)
    b. A mixture of atoms d. a mixture of elements and compounds

14. A group of pure substances in the same area at the same time is called a(n)

    a. mixture. c. compound
    b. element d. molecule

15. If 1,000 grams of tellurium melts at 165 degrees, at which temperature will 1 gram of tellurium melt?

    a. 16.5 degrees because there is 1/1000 the amount in the second scenario.
    b. 1.65 degrees because there is 1/1000 the amount in the second scenario.
    c. 165 degrees because the amount of grams doesn't matter.
    d. 330 degrees because there aren't many molecules to share the heat.

16. Describing a banana as yellowish green is an example of a

    a. physical property. c. physical change.
    b. chemical property. d. chemical change.

17. What is one element that has similar reactive properties to Xenon?

    a. Hydrogen c. fluorine
    b. Helium d. rubidium

18. The ability of gold to rust is an example of a

    a. physical property. c. chemical property.
    b. physical change. d. chemical change.

19. Haley is looking at the Sun through special glasses that she got from the Tellus Science Museum. As she is looking at the very dark object through her glasses (because you never look at the Sun without special glasses), she thinks about the lesson of how the Sun creates all of its heat. The lesson taught that through fusion (combining of hydrogen atoms into helium atoms) and fission (breaking helium atoms into hydrogen atoms), the Sun releases huge amounts of energy. The active processes of fusion and fission are examples of

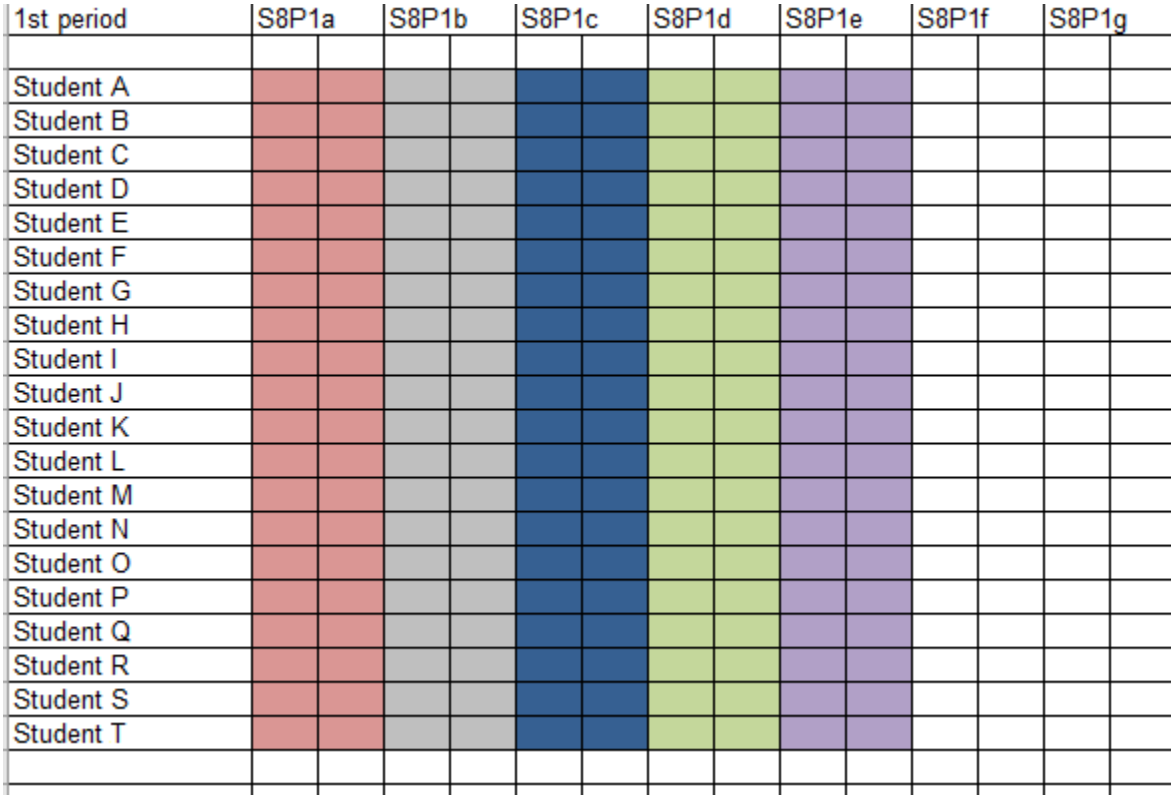
    a. physical property. c. physical change.
    b. chemical property. d. chemical change.

20. The statement "Matter cannot be created or destroyed, it only is transformed from one type into another" is called the

    a. Law of conservation of energy.
    b. Law of conservation of matter.
    c. Law of conservation of heat sources.
    d. Newton’s third law of motion.

APPENDIX D: Standards Mastery Spreadsheet

This is a section of the standard mastery spreadsheet that is used to track each student's mastery over time.



1st period	S8P1a		S8P1b		S8P1c		S8P1d		S8P1e		S8P1f		S8P1g	
Student A														
Student B														
Student C														
Student D														
Student E														
Student F														
Student G														
Student H														
Student I														
Student J														
Student K														
Student L														
Student M														
Student N														
Student O														
Student P														
Student Q														
Student R														
Student S														
Student T														

APPENDIX E: Chemistry Posttest

Chemistry Posttest

1 The smallest part of a compound that has all of the same properties of that compound is a —

a. molecule.
b. element.
c. mixture.
d. atom.

(This image was removed due to copyright)

2 What is the term that best describes the picture below?

a. compound
b. element
c. mixture
d. molecule

(This image was removed due to copyright)

3 Jenny is looking at the picture below and wonders what time of chemical it is. Bob thinks that the chemical is a compound because it is made of many atoms. Jim thinks it is an atom because all of the atoms are the same. Jimena thinks it is an element because it is made of more than two atoms. Who is correct and why?

a. Jimena is correct because elements are made of two or more atoms.
b. Bob is correct because compounds are made of more than two atoms and a compound is the only possible choice.
c. Jimena is correct that it is an element, but an element can be made of any number of atoms, but must be made of the same type of atom.
d. Jim is correct because an atom is made of two or more atoms that are the same kind.

4. What is ozone (O_3) considered?
   a. compound
   b. atom
   c. mixture
   d. element

5. A student is testing a solid material to determine whether it is a pure substance or a mixture. Which observation would MOST likely indicate that the material is a mixture?

    a. The material has crystals of two different colors.
    b. The material does not dissolve completely in water.
    c. The material does not melt when it is heated over a burner.
    d. The material reacts with an acid solution to form bubbles of gas.

6. Directions: Color each answer you want to select. You must select all the correct answers.

Which of the following are molecules?

(This image was removed due to copyright)

7. A scientist is looking to create a new anti-virus but is having trouble coming up with the correct combination to hold it for shipment. The anti-virus cannot keep for long periods of time if it is left in a pure substance. Which of the following choices would do the best job of keeping the anti-virus fresh?

    a. A combination of water and sugar because this is a pure substance that is proven to keep small organisms alive.

    b. A liquid like fresh-squeezed orange juice because it is a pure substance straight from a fruit.

    c. A combination of water and salt because it is a mixture, not a pure substance.

    d. A gas such as oxygen would keep the anti-virus fresh because it is a pure substance that you cannot see.

8. A student studies four chemicals in a laboratory investigation.

(This image was removed due to copyright)

Which chemical cannot be further broken down into other chemicals using ordinary laboratory processes?

a. 1 c. 3
b. 2 d. 4

9.

(This image was removed due to copyright)

Molecules that are packed very tightly together form a…

a. gas. c. mixture.
b. atom. d. element.

10. Pedro and Denise were sharing a snack. Pedro drank some hot tea while Denise drank ice water. Which BEST explains the difference between the molecules in the hot tea and the ice water?
    a. The molecules in the ice water move faster than those in the hot tea.
    b. The molecules in the ice water move slower than those in the hot tea.
    c. The molecules in the hot tea have less energy than those in the ice water.
    d. The molecules in the hot tea have the same amount of energy as those in the ice water.
11. Which of the water samples described below has the greatest average kinetic energy per molecule?
    a. 1 liter of ice at a temperature of –50°C
    b. 10 liters of ice at a temperature of –75°C
    c. 1 liter of water at a temperature of 75°C
    d. 10 liters of water at a temperature of 50°C

12. The diagram shows molecules of water in three different phases.

(This image was removed due to copyright)

What BEST represents the phases of water from 1 to 3?

a. solid, gas, liquid
b. gas, solid, liquid
c. liquid, gas, solid
d. gas, liquid, solid

13. Which of the following is a chemical property of matter?

a. Shape c. Size
b. Color d. Reactivity

14. Which of the following is not a physical property of water?

a. It forms a crystalline structure as a solid.
b. It decomposes into H_2 and O_2 gases.
c. It boils at 100°C when the pressure is 1 atm.
d. It freezes at 0°C when the pressure is 1 atm.

15. Tessa is trying to identify five rocks she found in her backyard. She records the density, odor, color, and shape for all five rocks. Which category of the rocks is Tessa observing?

a. Physical changes c. chemical changes
b. Physical properties d. chemical properties

16. A student has two solid samples of the same substance. Which property do the substances MOST likely have in common at the solid state?

a. Total mass c. Total volume
b. Density d. Color

17.

(This image was removed due to copyright)

When geologists are trying to identify certain rocks, they often place a few drops of diluted hydrochloric acid on the rocks. Sometimes the rocks effervesce when acid is dropped on them.

a. The age of the rocks.
b. The density of the rocks.
c. The amount of minerals in the rocks.
d. The chemical properties of the rocks.

18.

(This image was removed due to copyright)

a. Tearing paper c. Coloring paper
b. Burning paper d. Crumpling paper

19. As part of a study, a scientist observed a number of different molecular changes in matter. Which of the following observations provides evidence of a physical change?
    a. Observing heat from a log burning in a fireplace.
    b. Observing that light is used to make a sugar in a plant cell.
    c. Observing the changes in a cake's texture as it bakes in an oven.
    d. Observing the shards of broken glass after a bottle is broken.\

20. Which of the following is not an example of a physical change?
    a. burning cheese c. melting cheese
    b. freezing cheese d. cutting the cheese

21. In a classroom demonstration, a teacher pours sulfuric acid on some granulated sugar in a beaker. The sugar turns yellow and then black. Smoke rises and a strong smell is released. This demonstration is an example of what kind of change?
    a. physical change b. chemical
    b. electrical change d. iconic

22. Louis was investigating physical and chemical changes in matter. Which of these changes that Louis found involves a chemical change in matter?

a. Evaporation of water
b. Grinding rock
c. Melting of ice
d. Rusting of metal

23. Referring to the periodic table, the element calcium should have the most properties in common with

(This image was removed due to copyright)

a. Chlorine (Cl)
b. Potassium (K)
c. Gold (Au)
d. Magnesium (Mg)

24. Copper and gold have similar reactive properties. On the Periodic Table of the Elements, these elements are MOST likely to
    a. be located in the same group.
    b. be located in the same period.
    c. have the same mass
    d. have the same number of protons.

25. Which set of elements contains only metals?
    a. iodine, iron, nickel
    b. sodium, chromium, copper
    c. helium, carbon, gold
    d. phosphorus, nitrogen, oxygen

26. The Periodic Table of the Elements organizes elements according to their properties. A section of the periodic table is shown.

(This image was removed due to copyright)

Which set of elements below is the MOST similar in chemical behavior?

a. H, Be, Sc
b. Fr, Ra, Rf
c. Ti, V, Cr
d. Be, Ca, Ra

27. Element **X is a good conductor of electricity. Which of the following MOST likely describes other elements that are good electrical conductors?**
    a. All elements in the same row of the periodic table as X.
    b. All elements in the same column of the periodic table as X.
    c. All elements that can be combined with X to form ionic compounds.
    d. All elements that can be combined with X to form covalent compounds.

28. If 100 grams of vinegar and 5 grams of baking soda are poured in a container, a amount of gas will be produced. What will the final mass of the products be if the gas is trapped in the container?
    a. 100 grams 105 grams
    b. 104 grams 110 grams

29. A beaker contains a sample of water with a mass of 325 grams. The water in the beaker is boiled and weighed again after it cools. The new mass of the water is 305 grams. In this example of the conservation of matter in physical changes,
    a. the mass is less after it cools because water has less mass as a gas.
    b. the mass of the water was 305 grams and the mass of the water vapor was 20 grams.
    c. the process of boiling destroyed 20 grams of the water and left 305 grams of water.
    d. the heat energy created by boiling water makes up the rest of the mass.

30. When heated, mercuric oxide decomposes to form liquid mercury and oxygen. A scientist heated 10 grams (g) of mercuric oxide and formed 9.3 grams of liquid mercury. How many grams of oxygen were formed?
    a. 0.7 g c. 10.0 g
    b. 9.3 g d. 19.3 g

31. A flat piece of paper has a mass of 5 grams. When the paper is crumpled into a ball, the mass of the crumpled paper is
    a. much more than that of the flat paper.
    b. slightly more than that of the flat paper.
    c. the same as that of the flat paper.
    d. the same as that of the flat paper.

32. The chemical equation below shows the amount of the reactants used and the amount of only one of the products formed.

(This image was removed due to copyright)

How much water (H_2O) should be formed in this chemical reaction?

a. 5g c. 27g
b. 9g d. 31g

33. A **student kept a notebook during an investigation. Which recorded observation was MOST likely a physical change?**
    a. The solution was heated for two minutes until it boiled.
    b. A solid formed when two liquids were mixed together.
    c. Two solutions were mixed and the resulting solution felt hot.
    d. The color of two mixed solutions changed from clear to white.

APPENDIX F: Standards-Based Progress Report

Overall Score: _____
(Should be over 70%)

Each individual standard should be at Mastery 80% to achieve an average passing score (Tier Three) on the Milestones Test:
Nm = less than 50% (Tier One)
pm = 50-69% (Tier Two)
m = 70%-89% (Tier Three)
hM = 90%-100% (Tier Four)

S8P1a: Difference between atoms and molecules. _____

S8P1b: Difference between molecules and mixtures. _____

S8P1c: Characteristics of solids, liquids and gases. _____

S8P1d: Identifying chemical and physical properties. _____

S8P1e: Identifying chemical and physical changes. _____

S8P1f: Reading and using the periodic table. _____

S8P1g: The Law of Conservation of Matter. _____

APPENDIX G: School System Permission Letter

March 5. 201[redacted]

Liberty University

School of Education

Lynchburg, VA 24515

School of Education:

Mr. Matthew Odell has requested to complete his research for the Ed.D. in Curriculum and Instruction in th[redacted]. His study will be conducted using testing of each student's individual knowledge of the science standards and communication of these findings with parents to understand whether academic achievement improves under these conditions.

Mr. Odell has permission to complete his study, including: using individual student test scores and benchmark data from our district as specified in his research request.

Please feel free to contact me via email or phone if you have any questions.

Sincerely,

[redacted]

Professional Learning Coordinator

[redacted]

Equal Opportunity Employer

APPENDIX H: School Principal Permission Letter

March 1. 2017

Liberty University

School of Education
Lynchburg, VA
24515

SchoolofEducation:

Mr. Matthew Odell has requested to complete his research for the Ed.D. in Curriculum and Instruction in the [redacted] His study will be conducted using testing of each student's individual knowledge of the science standards and communication of these findings with parents to understand whether academic achievement improves under these conditions.

Mr. Odell has permission to complete his study, including: using individual student test scores and benchmark data from our district as specified in his research request.

Please feel free to contact me via email or phone if you have any questions.

Sincerely,

[redacted]

Equal Opportunity Employer

APPENDIX I: IRB Approval Letter

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

May 3, 2018

Matthew Odell

IRB Approval 3243.050318: Assessing Content Mastery: Using Quasi-Experimental Research to Study the Effect That Standards-Based Progress Reporting to Parents May Have on Student Achievement in Science at One Georgia Middle School

Dear Matthew Odell,

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

[redacted]

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

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research

The [redacted]

LIBERTY
UNIVERSITY.

Liberty University | Training Champions for Christ since 1971

APPENDIX J: Parent Consent Form

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

5/3/2018 to 5/2/2019 Protocol # 3243.050318

PARENT CONSENT FORM

Assessing Content Mastery: Using Quasi-Experimental Research to Study the Effect that Standards-Based Progress Reporting to Parents May Have on Student Achievement in Science at One Georgia Middle School

Matthew S. Odell

Liberty University School of Education

Your child is invited to participate in a research study of whether or not parental involvement with the mastery of standards, as measured by standards-based reporting, has an impact on the academic success of your middle school student. Your student has been selected as a possible participant because he or she is a 7th or 8th grade student currently enrolled in the selected school. At this level of education, it is vital to understand how teachers can communicate most effectively with parents, and this study will contribute to the data in this area. I ask that you read this form and ask any questions you may have before agreeing to be in this study.

This study is being conducted by: Matthew S. Odell, Education Doctoral Candidate at Liberty University.

Background Information: **The purpose of this study is to determine if there is a difference between the level of academic success experienced by students whose parents receive a weekly standards-based progress report and those whose parents do not receive a weekly standards-based progress report.**

Procedures: **If you agree to allow your child to be in this study, I would ask you to do the following things:**

1. Consent to my having access to your child's test scores during the testing period.
2. Place this consent form, completed or not, in the stamped addressed envelope that is included and place the envelope in a nearby mail box for return to me. This entire process should be completed in 5-6 weeks.

I would also ask you to allow your child to participate in the following group dependent tasks during the study:

1. Complete Quiz #1 (30 minutes)
2. Complete Quiz #2 (30 minutes)
3. Complete Quiz #3 (30 minutes)
4. Complete Quiz #4 (30 minutes)
5. Bring home an updated standards-based progress report (SRBP) to you for review after each quiz. (45-60 minutes to complete/48 hours to take home and let parent review)
6. Review study guide related to the lowest performance area (mastery) with your child after each SBPR. (45-60 minutes to complete)
7. Complete homework assignment for applicable standards identified on each SBPR (up to 4 times). (45-60 minutes to complete)
8. Complete Post-Test (60 minutes)

The groups for this study will include a 7th grade control group, a 7th grade test group, an 8th grade control group, and an 8th grade test group. These groups will be chosen randomly by class.

Approximately 400 students will be a part of this study. The control groups will only take the quizzes and be told their quiz grades. They will be allowed to work independently based upon their overall quiz grade. The treatment/research group will take the quizzes, be told their overall quiz grade, will receive a standards-based report card, will take that SBPR home to their parents with homework to help them work on their lowest one or two standards in the SBPR. Both groups will take the final post test to evaluate their overall scores and to compare means between the control groups and the treatment/research groups.

Risks and Benefits of Being in the Study: **This study has minimal risks. The potential risks involved in this study are minimal and include a breach of confidentiality if**

the data are lost or stolen.

Direct benefits of participating in this study are that your child may benefit by an improvement in their academic achievement by earning a higher score if they are chosen as part of the research group.

Benefits to society may include that your child's participation will assist the education community in learning more about the importance of parental involvement. Secondly, there may be a better understanding on how important it is to intervene early to ensure a positive impact on these students' future.

Compensation: **Participants will not be compensated for participating in this study.**

Confidentiality: **The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records. I may share the data I collect from your child for use in future research studies or with other researchers; if I share the data that I collect about your child, I will remove any information that could identify him or her, if applicable, before I share the data.**

- Any and all data received and utilized will only have the initial of the school of attendance and a number assigned to your student. If there is any other personal data visible, it will be blacked out.
- Data will be stored on a computer which is password protected, and any documents that are in paper form will be locked away in a file box specified for this research with me having the only key. All the data will be destroyed by cross shredding at the end of the three-year retention period as required by federal regulations. There is no anticipated future use of any data acquired from this research.

Voluntary Nature of the Study: **Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect his or her current or future relations with Liberty University or your child's school. If you decide to**

allow your child to participate, he or she is free to not answer any question or withdraw at any time without affecting those relationships.

How to Withdraw from the Study: **If your child chooses to withdraw from the study, please contact the researcher at the email address/phone number included in the next paragraph. Should your child choose to withdraw, any data collected will be destroyed immediately and will not be included in this study.**

Contacts and Questions: **The researcher conducting this study is Matthew S. Odell. You may ask any questions you have now. If you have questions later,** you are encouraged **to contact him at msodell@liberty.edu or at 423-715-9639. You may also contact the researcher's faculty advisor, Dr. Constance Pearson, at cpearson@liberty.edu.**

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged **to contact the Institutional Review Board, 1971 University Blvd, Green Hall 1887, Lynchburg, VA 24515 or email at irb@liberty.edu .**

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

Statement of Consent:

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

Signature of parent or guardian:_____-Date:

Signature of Investigator:_____Date:

APPENDIX K: Child Assent Form

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

5/3/2018 to 5/2/2019 Protocol # 3243.050318

ASSENT OF CHILD TO PARTICIPATE IN A RESEARCH STUDY

What is the name of the study and who is doing the study?

Matt Odell, doctoral candidate at Liberty University School of Education, is conducting this study. The name of the study is "Assessing Content Mastery: Using Quasi-Experimental Research to Study the Effect that Standards-Based Progress Reporting to Parents May Have on Student Achievement in Science at One Georgia Middle School."

Why are we doing this study?

We are interested in studying standards-based progress reports because we want to find out if a standards-based progress report is a more effective tool than a regular report card.

Why are we asking you to be in this study?

You are being asked to be in this research study because you are a 7^{th} or 8^{th} grade science student at the school selected for this study.

If you agree, what will happen?

If you are selected for the control group in this study, you will complete your classwork normally and take a weekly, standards-based quiz.

If you are selected for the treatment group in this study, you will complete your classwork normally. You will also complete a weekly, standards-based quiz. The results will be

recorded in a standards-based progress report. You will be given a standards-based progress report each week during the study to take home to your parents. This will allow you and your parents to see where you are mastering standards and areas that need improvement.

Do you have to be in this study?

No, you do not have to be in this study. If you want to be in this study, then sign your name below. If you don't want to, it's OK to say no. I will not be angry. You can say yes now and change your mind later. It's up to you.

Do you have any questions?

You can ask questions any time. You can ask now. You can ask later. You can talk to me. If you do not understand something, please ask me to explain it to you again.

The researcher conducting this study is Matthew S. Odell. You may ask any questions you have now. If you have questions later, you are encouraged to contact me at msodell@liberty.edu or at 423-715-9639. You may also contact my faculty advisor, Dr. Constance Pearson, at cpearson@liberty.edu.

Signing your name below means that you want to be in the study.

Signature of Child Date

IRB Contact Information:

Liberty University Institutional Review Board,

1971 University Blvd, Green Hall 1887, Lynchburg, VA 24515 or email at irb@liberty.edu.

APPENDIX L: Atoms, Molecules, and Mixtures Study Guide

Atoms, Molecules and Mixtures

1. **Atom**-the simplest, complete piece of matter

   a. it is made of protons (+), electrons (-), and neutrons (neutral).

   b. each element of the periodic table is one atom of the specific element.

2. **Molecules**-made of more than one atom

   a. created by a chemical reaction

   b. two types {like molecules (of the same element) and compounds}

3. **Molecule of an element (simply called a molecule)**-a molecule made of two or more of the same type of atom/element.

4. **Compound Molecule (simply called a compound)**-a molecule made of two or more different types of atoms/elements.

5. **Subscript**-a number written below and to the right of the atom it is describing.

   It tells how many of a specific atom/element are present.

6. **Coefficient**-a number written to the left of an atom or molecule.

It tells how many atoms are in a specific part of the formula.

An atom; an element	 (You can also add a statement that the image was removed due to copyright)
Molecule of an element	 (You can also add a statement that the image was removed due to copyright)
Compound molecule	 (You can also add a statement that the image was removed due to copyright)

APPENDIX M: States of Matter Study Guide

States and Changes of Matter

States and changes of matter are physical properties and physical changes. Water does not change from its chemical formula of H2O no matter whether it is a solid, liquid or gas. When the type of matter stays the same, it is a physical property or physical change. For the purposes of this study guide, we will use the molecule water (H_2O). We will follow the path of water through its phases. We will begin with water in the solid phase/state (Ice).

(You can also add a statement that the image was removed due to copyright)

1. Solid-a state of matter in which the molecules have minimal kinetic energy. They vibrate a little, but they cannot move inside of the container. A solid has a definite shape and a definite volume. See the picture above. Water is an ice cube.
2. Liquid-a state of matter in which the molecules have increased kinetic energy and can flow past each other. There is still not enough energy to break the pull of gravity so the molecules must fill the bottom of the container first and move up from there. A liquid has a definite volume, but not a definite shape because it takes the shape of its container. Water is a liquid drinking water.

(You can also add a statement that

Here is an example of two different containers with liquid in them. One liquid is round and the other is cylindrical

right)

3. Gas-a state of matter in which the mole ey vibrate a lot and run into each other. Gases have enough id is necessary to keep them confined. A gas has neither a definite shape nor a definite volume because it takes the shape of the container and fills the entire container. When the container changes, the shape and volume of the gas changes. Water is water vapor.

   Changes of State:

(You can also add a statement that the image was removed due to copyright)

APPENDIX N: Atoms and Molecules Review Homework

Atoms and Molecules

For the following questions, identify whether the combination is an atom, a like molecule or a compound (different molecule). In the first blank, identify whether you are looking at an atom, molecule or compound. In the second blank, identify how many total atoms there are.

	Atom, elemental molecule, or compound	How many atoms?
1. Na	_____	_____
2. NaCl	_____	_____
3. O_2	_____	_____
4. H_2O	_____	_____
5. Ag	_____	_____
6. Ne	_____	_____
7. H_2	_____	_____
8. $2CO_2$	_____	_____
9. $C_6H_{12}O_6$	_____	_____
10. C_3	_____	_____
11. NaOH	_____	_____
12. He	_____	_____
13. CO	_____	_____
14. Ar	_____	_____

APPENDIX O: States of Matter Review Homework

Worksheet for States of Matter

Answer the following in complete sentences.

1. Name the four states of matter.

_____

_____.

2. What occurs at the freezing point of a substance?

_____

_____.

3. What is plasma and how does matter become plasma?

_____

_____

_____.

4. Describe in one sentence what kinetic theory of matter states.

_____

_____.

5. If the melting point and freezing point are the same, what determines the state of matter at that temperature?

_____

_____.

6. Explain how molecular motion and heat relate to ice, liquid water and water vapor (gas form).

_____

_____

_____.

7. The melting point of iron is 1,530 degrees Celsius. If the temperature of iron drops to 1,300 degrees, what will happen?

_____.

Multiple Choice Questions

1. Which is an example of matter in the plasma state?

a. dry ice b. gelatin

c. syrup d. a star

2. The motion of particles in a liquid is
   a. more than in a gas. b. the same as in a gas.
   c. more than in a solid. d. less than in a solid.

3. Matter that has a definite shape and a definite volume is called a/an
   a. solid b. liquid
   c. gas d. plasma

4. In which of the following do the molecules have the least energy?
   a. A cup of warm water. b. A pan of hot oil.
   c. A pitcher of lemonade d. A frozen popsicle

5. Which of the following is the reverse of vaporization?
   a. freezing b. condensation
   c. melting d. sublimation

6. At -21 degrees Celsius, Mercury is a
   a. solid b. liquid
   c. gas

7. Matter that has no definite shape or volume is called a/an
   a. solid b. liquid
   c. gas d. plasma

8. If a substance changes from a solid to a gas, while skipping the liquid phase, it has undergone which physical change?
   a. melting b. freezing
   c. condensation d. sublimation